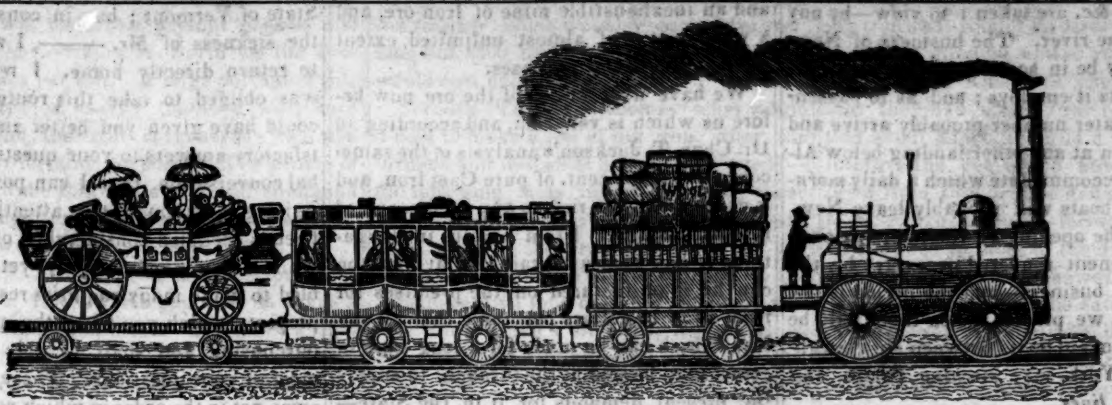

AMERICAN RAILROAD JOURNAL, AND ADVOCATE OF INTERNAL IMPROVEMENTS.

PUBLISHED WEEKLY, AT NO. 132 NASSAU STREET, NEW-YORK, AT FIVE DOLLARS PER ANNUM, PAYABLE IN ADVANCE.

D. K MINOR, and GEORGE C. SCHAEFFER, { EDITORS AND PRORIETORS.}

SATURDAY, SEPTEMBER 24, 1836.

[VOLUME V.—No. 38.

CONTENTS:

AMERICAN RAILROAD JOURNAL.

NEW-YORK, SEPTEMBER 24, 1836.

NOTICE TO CONTRACTORS.

PROPOSALS will be received at the Engineer's Office. in the city of Lancaster, on Wednesday, the 19th day of October next, for the Excavation, Embankment, Wall, &c., required on twenty-five miles of the Susquehanna Canal, commencing at Kline's run, (three miles below the Columbia Bridge,) and extending along the West side of the Susquehanna river, to the "Maryland State Line."

The work will be ready for examination by Contractors, at any time after the 25th inst., and the Map, Profile and Specification, may be seen at the office, one week previous to the letting.

The unusually heavy character of the work, (which affords excellent winter jobs,) offers great inducements for the attendance of Contractors possessing energy and enterprise.

It is expected that the extension of the Canal to "Tide Water," will be ready for letting about the 1st of December.

No mechanical work to be let at present.

EDWARD F. GAY,
Chief Engineer, S. C.

Lancaster, Sept. 13, 1836. 51—38
1½ square $4 12

NEWBURGH AGAIN.—We referred, a short time since to the brilliant prospects of this village—and to its advantages in relation to the termination of the Great *New-York and Erie Railroad*—and in our last we published entire the very interesting and important Roport of Mr. Sargent, the Engineer of the road, which will be found fully to sustain us in our remarks. This Report should be read by every business man in the community; especially those who are interested—and who is not?—in the New-York and Erie Railroad.

It may not be generally known, yet it should be, that this branch of the road, or the Newburgh road, which is to terminate at Newburgh is to pass the whole length of the village—along the margin of the river—and it follows of course that the day is not far distant when it will be lined with a row of storehouses to receive produce and merchandize.

When it is known that the *ascent* to be overcome from the point where the roads diverge, to *Newburgh* is only 148 feet and the *descent* 390 feet, it will be readily understood that very little expense will occur for traction in the direction of the heaviest trade—and it will follow of course that the *business* will follow the most *natural* channel when there is a choice, therefore NEWBURGH *must* become the *principal* outlet for the five hundred—yes, in a few years, *five thousand* miles of railroad to the very heart and extreme points of the most fertile region of country on the Globe.

What then may not be anticipated in the way of improvements at this delightful place? Indeed so well are business men of this city satisfied of the important advantages of Newburgh for manufacturing, as well as commercial, purposes, that large purchases have been made within a few weeks, of real estate on which substantial improvements are to be made immediately—one company alone are about to commence buildings in which will be employed, in the course of six months, over one hundred hands in its different departments—a steam saw mill will also be erected this winter—and probably a *Carriage and Railroad Axle* manufactory, employing forty or fifty men, will go into operation in the spring. Flattering, very flattering indeed, are the prospects of Newburgh, and such are the present indications of business that houses and workshops are in great demand, every house in the place being occupied. Indeed, *fifty* to *one hundred* dwellings will be required there next year, and no better investment can be made than in good *dwelling* houses at Newburgh; they will pay fifteen per cent. interest on their cost, on a lease for three to five years. Yes, we know of a man who will contract to take *ten* good dwellings, of two stories each, built to a plan furnished, to accommodate *two* families, on a lease of three to five years, at fifteen per cent. on the cost of the lot and building. And to any one disposed to put up such buildings at Newburgh, and have them ready to occupy this fall, or early in the spring, say by the 1st of March, all necessary information will be given at this office.

As a place of business, there is no other on the Hudson, between this city and Albany, which surpasses it.

There are no less than *four* steamboats owned here, and employed in the New-York trade—two of which, the HIGHLANDER, owned by T. Powell & Co., and the WASHINGTON, owned by D. Crawford & Co., do credit to their enterprising proprietors—the others, the SUPERIOR owned by Davis and Oakley, and the WM. YOUNG by B. Carpenter & Co., are good business boats and afford comfortable accommodations for passengers.

Another new boat is now, we understand, nearly completed, which is owned by, and to run from the dock of, B. Carpenter & Co., which will probably be equal, in speed and comfort, to the *Highlander*, a boat not surpassed—when comfort, safety

and speed, &c. are taken i to view—by any other on the river. The business of Newburgh may be in some measure judged of, by the boats it employs; and as to passengers, a greater number probably arrive and depart, than at any other landing below Albany—to accommodate which a daily *morning* line of boats will probably leave Newburgh on the opening of the next season—an engagement rendered necessary by the increase of business—and the period is not far distant, we predict, when there will be *hree daily* lines of boats between Newburgh and New York, viz: *morning, twelve. and five o'clock lines.*

The beauty and health of Newburgh will undoubtedly make it a desirable residence for families to educate their children, and we may with confidence say that the citizens of Newburgh will take proper measures to have other schools, in addition to those they now have, of the first order, as as they may be required.

We cannot permit this opportunity to pass without calling attention to one for Young Ladies, already established there, and very liberally patronised. We refer to that established and under the control of the Rev. Mr. Prime. It is pleasantly situated a little to the north of the village, and has about 75 pupils, which are all that can be accommodated.

There are other schools of reputation, as we are informed, but of which we can only speak from report.

There are also six or seven places of public worship, which are generally well attended; and, judging from observation, it may be truly said of Newburgh, that it has a population not surpassed by any other, of equal numbers, for *industry, sobriety*, and *thriftiness*. They have generally earned what they possess, and therefore know how to take care of it. It has been well said of the *business* men of Newburgh—"*there are none more worthy of confidence.*"

BOSTON AND TROY (VERMONT) IRON COMPANY.

We have before us the charter granted by the Legislature of Vermont, at its last session for a Company with a view of bringing into use the rich ores of the "mountain State." This is a liberal charter. The Company is permitted to hold real estate to the amount of $300,000. At a meeting of the petitioners and their associates at Montpelier, this act of Incorporation was accepted, and a Company formed under it. The capital stock of said company has been divided into *Twelve Thousand Shares* at *Twenty Five* dollars per share. More than half of these shares have already been subscribed for, by persons in Vermont and in Boston, and about *one fourth* in *this* City, leaving a small amount yet to be taken. The property of this Company consists of about 1400 acres of land, in the town of Troy, Vermont. It embraces an exceedingly rich, and an inexhaustible mine of Iron ore, and a water power of almost unlimited extent for manufacturing purposes.

We have a specimen of the ore now before us which is very rich, and according to Dr. Chas. T. Jackson's analysis of the same contains 62½ per cent. of pure Cast Iron, and is consequently as rich as any yet discovered in this country. From careful investigation, it has been ascertained that Pig Iron can be manufactured on the premises for from 14 to 15 dollars per ton; that all the Iron which can be made for a long time to come, may be sold at the furnace, to supply the present demands for it in the State—and at the rate of from 45 to 50 dollars the ton; and should more of the Iron ever be manufactured by the Company than could be sold at the furnace, it can be transported to Albany, N. Y., for the sum of $8 50 per ton, where it will sell readily for 45 to 50 dollars the ton.

We are induced to believe that this Company will possess great advantages for manufacturing Iron; and that they can supply a superior article; and we trust they will in some measure dispel the opinion so prevalent in this country that we must go to Europe for the immense amount of Iron, and especially of *Railroad Iron* used, and to be used here.

It is, indeed, mortifying that, with such an abundance of the richest ore, and an inexhaustible supply of *fuel*, we must send our millions abroad, instead of paying them to our own enterprising and deserving citizens. A different course of things must soon, we feel confident, exist, when we shall not only produce, but also manufacture for all our own purposes, our own *Iron* and *Steel* in the greatest perfection.—To such an end, we with great confidence look; and therefore hail with enthusiasm, the appearance of every new establishment which shall tend to produce such a result.

The accompanying letter from James Anderson, Esq., of Boston, who was selected to examine and report in relation to the property and operetions of the Company, will be highly satisfactory to those who take an interest in the matter.

Information in relation to future operations of the Company may be obtained by applying to J. E. Benners, Esq., 67 Wall street, New-York—or to the office of this Journal.

☞ It should be borne in mind that the contemplated Railroad from Hartford, Conn., up through the *Connecticut* Valley, will probably pass through the town of Troy, where these works are to be located.

Extract of a letter to a Gentleman of this city, dated

Boston, August 21st, 1836.

My Dear Sir,—I intended to have returned to Boston by the way of New-York, for the purpose of reporting to you verbally what I now propose to write you, respecting the property in the Town of Troy, State of Vermont; but in consequence o the sickness of Mr. ——, I was obliged to return directly home. I regret that I was obliged to take this route, because I could have given you better and more satisfactory answers to your questions, in verbal conversation, than I can possibly do in writing. Although the attentions of my friends occupied considerable of my time, while I remained in Troy, yet I was enabled to make many enquiries respecting the property which you have the privilege of purchasing, and shall be able to answer most of your questions. These I shall answer, not in the order in which you put them—but in that which is most convenient to me.

First, then—The town of Troy lies in the north part of Vermont, Orleans Co., and is about forty miles from Lake Champlain. It contains about 1000 inhabitants, a number of saw and grist mills and I think two small woolen factories; and it is represented to be extremely rich in Iron Ore; Marble and Lime Stone. The Iron mine which you have purchased is situated near the middle of the town.

Second. The Iron mine is peculiarly, and as it appears to my eye, most advantageously, situated. The ore lies imbeded in a ridge of land which rises more than fifty feet above the plain, and is to all appearances inexhaustible. I walked over and around this ridge and examined the veins of ore which every where show themselves from the summit to the base of the mountain, and many large masses of the ore weighing from one to two tons, are scattered along the sides of the ridge, which have been detached by some convulsion, or by their own weight. The mountain, in the language of a resident, is truly "a mountain of *Iron Ore.*" From the results of Dr. Jackson's analysis of this ore, it contains from 64 to 65 per cent. of pure Iron, and is therefore as rich as any ore yet discovered, and is vastly richer than that found in Pennsylvania, from which so much Iron is made. It seems also from Dr. Jackson's analysis and certificate, that this ore contains a highly magnetic quality which renders it peculiarly appropriate for smelting into soft and ductile, yet tenacious iron.

Third. If I remember rightly the amount of land, which your bond gives you the tittle to, is not far from 1400 acres within this space, I learn that most of the iron ore of the town, and in fact, of this part of Vermont, is located. The principal river of the town (the Missisqui river) also runs through it, and very near the base of the mountain which contains the ore. There are also two good farms on this land—one of which lies on the banks of the river where mills will be erected, and upwards of 25 acres of it is cleared land, and on this portion of the farm is a good house and barn. The other farm is still more valuable, and as I was in-

formed will yield this present season 100 tons of hay—which is worth on the spot six dollars per ton. A large portion of this 1400 acres is heavily timbered with hard wood, and the soil is generally rich and good for farming purposes. The people of Troy tell me that the land would command on average from 5 to 10 dollars per acre after the wood shall have been cut off.

Fourth. As it respects the water power of Missisqui river, which you were so anxious to have me examine, I will remark that there is, I am sure as much *fall* and *power* as was represented to you. The Missisque river, as I have observed, runs through your lands, and is a deep and rapid stream. The fall in it is so considerable that a number of dams can be thrown across it within the boundaries of your purchase on which many mills might be erected. The dam on which the iron mills, and near which the furnaces should be built is but a short distance from the mine which contains the ore. The river at this place is 150 feet wide and was from four to five feet deep when I was there. By building a dam ten feet high a fall of water of from 14 to 15 feet can be secured. This spot seems to be formed by nature for a mill power, for the bed of the stream here is formed of a solid rock, and the river forms a kind of curve, and is bordered by high banks so as to enable you to form a large pond above. About two miles below this is another place where a still larger water power can be had at small expense. This is the mill privilege which Mr. Young has bonded to you. The former privilege, and on which your works should be erected, is about one and a half miles from the mine—and the land from the mine to this water privilege has a gradual descent—so that it would be easy to transport the ore to the furnace over it upon a cheap railroad, by gravity, the descending load taking up the empty cars.

Fifth. In answer to your question whether "materials for building dams, mills and furnace—and also for smelting iron ore can be obtained in abundance"—I will state that lumber can be obtained from your own premises, and that bricks can be purchased near by for three dollars per thousand.—Charcoal, which is an important and necessary article in the manufacture of iron, may be obtained in any quantities in the immediate vicinity and at the very low price of *three dollars* for the *hundred* bushels—a number of persons were anxious to contract to furnish coal at this price.

Sixth. To the question "what would it cost to build a dam, erect a furnace—a saw mill—and a power bellows"—I ascertained that a dam might be thrown across the stream at the place above named for 500 dollars—and that a saw mill might be built upon it for the like sum—a Mr. Willis Williams, a mill-wright, offered to contract to build both for the sum named—what a power bellows would cost I was unable to learn—a furnace which would be capable of running out 1200 tons of pig iron in a year; would cost about 1500 dollars.

Seventh. To the question—"what would it cost to make a ton of pig iron, after the furnace and mill shall have been erected"—the following facts furnished me by those who have been conversant with the business, will give the proper answer.

For raising the ore and transporting to the furnace, two tons of it, or a quantity sufficient to make a ton of pig iron	\$1 50
For 200 bushels of charcoal at \$3 per 100	6 00
For preparing the ore for the furnace, say	1 50
For the labor of five men	5 00
	\$14 00

The sum of 75 cents for raising a ton of ore and transporting it to the furnace is indeed small, but there are many persons now in Troy who are ready to contract to do it for that small compensation. This fact shows how advantageously the ore is situated for mining. At Franconia, and also on the west side of Lake Champlain, I understand that it costs 7 and 8 dollars a ton to mine the ore, so deep in the earth is it imbedded.

Eighth. You ask "what would it cost to transport a ton of pig iron from the furnace to Albany or New-York." The distance to Keyes' wharf at Highgate on Lake Champlain is 38 miles by a very good road—and a ton of pig iron can be transported from the furnace to said wharf at \$5 per ton.—From said wharf down the Lake and through the canal to Troy or Albany, N. Y., it would cost $3\frac{1}{2}$ per ton—so that a ton of pig iron made and transported to Troy or Albany would cost (14 and $8\frac{1}{2}$) $22\frac{1}{2}$ dollars. A ton of pig iron would sell at present at either of these places for from 40 to \$50 per ton—and should it equal in quality that imported, it would command \$60 per ton.

Ninth.—There is, however, already, a large quantity of pig iron used in Vermont, and I have no doubt but that every pound that could be made at the contemplated works, would be sold at the furnace for forty-five or fifty dollars the ton. For now there are many furnaces in the vicinity of the lake, and in the north part of the State which work vast quantities of pig iron, and many more furnaces would be erected provided the iron should be made in Troy. The proprietors of the furnaces now in operation, go to Montreal and other distant places for their pig iron, and pay sixty dollars a ton for it, and also a high price for carting it from those places to their furnaces.

I will observe here, that while I was in Troy, a committee of gentlemen from St Albans visited Troy, to ascertain if the iron works were to go into operation; and in case they were to, they were authorised to make an arrangement by which all the pig iron that should be made, might be carried to St. Albans; and so anxious were the people of St. Albans to effect this object, that they had already raised by subscription about \$1600, to build a good road, or improve the one which now leads to that town from Troy. The distance from Troy to St. Albans is about forty miles. I have now replied to most of the questions which you noted for me to answer, and shall be gratified should they be satisfactory, or of value to you. It may be, however, that I have given you no information in addition to what you are already in possession of.—In relation to the subject generally, I will observe, that from the inquiries which I have made respecting the quality, quantity, and the location of the ore, and the facilities for converting it into pig iron, I am decided in the belief that you will make a profitable investment by purchasing the premises and working the mines as you have proposed. And before closing this long, and perhaps tedious letter, I will suggest that should iron works be erected on the river near the mine of ore, this spot would doubtless become the centre of business of the town. At present there are two villages in Troy, situated at opposite extremities of the town. As is natural, there exists quite a rivalship between these two places in regard to business. Should the contemplated iron works ever be erected, it is the opinion of the people of Troy, that a new village would spring up near them, which would become the principal village of the town, and would monopolise most of the business which is now transacted in the two present existing villages. But I will draw to a close, for I find I am becoming so much interested in the subject that I may lead you astray, by suggesting what may possibly take place provided you should go on in your proposed undertaking, and yet I cannot close without expressing the hope that you will persevere. I hope so, too, more for the public than any private benefit which would result from such an undertaking. Millions of dollars are now sent out of the country to purchase iron, which ought and might be retained in the country, and paid to our own citizens for converting into iron the rich ore which now lays dormant and useless in our own soil. I hope the time will soon come when we shall make all the bar and railroad iron that may be demanded in our country. It is truly mortifying that we should be dependent upon foreign countries for that which our own country can produce in abundance, and at a much less price, even, than it can be manufactured for in those countries. Excuse me from this digression, and believe me that I shall be happy if the contents of this letter shall be acceptable to you.

Your friend and ob't. serv't.

JAMES ANDERSON.

P. S. Since the above was written Pig Iron has greatly advanced.

POUGHKEEPSIE AND ITS IMPROVEMENTS.

The following extract from the Boston Traveller gives but an imperfect idea of the present and prospective manufacturing operations of Poughkeepsie.

A recent visit to that delightful and flourishing village, has given us a high opinion of the enterprise and public spirit of many of its inhabitants. They have laid out new streets and public squares, and erected many new and elegant buildings, both for private and public purposes, which do them much credit. The schools and seminaries are of a high order, and their numbers are rapidly increasing, which will insure a large accession to the population of the place for purposes of education.

The shrewd forecaste of the intelligent and wealthy citizens of Poughkeepsie is evinced, as well in matters of business as in beautifying and adorning their village.—They hold out liberal inducements to manufacturers to locate there, and extend to them every facility the place affords, and Poughkeepsie, therefore, must become a place of great business—especially when the Railroad to Stockbridge, and a line of steamboats to New-York, shall be in operation. Its society is equal to that of any other town or city in the State, and its mechanics, or at least some of them, have few equals and no superiors.

The following extract from the Boston Traveller refers to one who would do credit to any age, or country. We shall refer again, and more particularly to Gen. Harvey's operations, as soon as we can find leisure to examine his machines now in operation and in course of construction.

Poughkeepsie, June, 1836.

"The extensive silk factory, owned by a company with a capital of $200,000, is completed, and nearly ready to commence operations. Gen. Harvey, a skilful machinist, and the inventor of some half score of "Yankee contrivances," has got up a screw company, with a capital of $200,000, which promises not a little toward the future prospects of the place. The screws are made by the machinery of Gen. H.'s invention, and with astonishing facility—the whole being accomplished by three rapid applications of the machinery. The first cuts the screw from the wire, and forms the head; the second forms the groove and finishes the head; and the third makes the screw, and turns out a highly polished and beautiful article—far superior to the English screws made by hand. It is expected that this establishment will manufacture not less than twenty thousand gross per week, and give steady employment to 300 hands. I saw in the same establishment a machine for coining money, made for the government mint; the model of a saw for felling trees, invented for the express benefit of a "down east" company of speculators; a machine for turning out horse shoes, perfect, with only one speedy operation; and a large number of machines for weaving stock frames, were in the "full tide of successful operation," all productions of Gen. Harvey's fertile genius."

AN ACCOUNT OF THE PORTAGE RAILROAD, OVER THE ALLEGHENY MOUNTAIN, IN PENNSYLVANIA.—BY S. W. ROBERTS, PRINCIPAL ASSISTANT ENGINEER.

The commencement of the construction of the Allegheny Portage Railroad, was authorised by an act of the Legislature of Pennsylvania, passed the 21st of March, 1831. Previous to that time, surveys of the Allegheny Mountain had been made by several eminent engineers; and these surveys had thrown much light on the topography of the country through which the Railroad was to pass.

Sylvester Welch, Esq. was appointed principal engineer of the work, by the board of Canal Commissioners; and he organised his locating party, and had the tents pitched near Lilley's Mill, at the head of the mountain branch of the Conemaugh, on the 12th day of April, 1831.

The locating party at the beginning, consisted of—Sylvester Welch, principal engineer; Solomon W. Roberts, principal assistant engineer; Patrick Griffin, surveyor, and twelve assistants and axe-men, and a cook.

The line was commenced at the head of the Little Conemaugh, and continued down the valley of that stream to Johnstown, a distance of 21 miles, where it connects with the western division of the Pennsylvania Canal. The western end of the Railroad was located on the 14th of May. In the month of May, Mr. W. Milnor Roberts joined the corps as principal assistant engineer, and traced the line from the turnpike crossing, near the summit of the mountain, to Lilley's Mill, a distance of five miles.

The grading and masonry of the twenty-six miles thus located, were contracted for at Ebensburg, on the 25th of May, and the work was commenced by clearing a track, 120 feet wide, through the forest,—most of which consisted of heavy spruce or hemlock timber. The location of the line from the turnpike crossing, near the summit, at Blair's Gap, eastward to Hallidaysburg, a distance of ten miles and two-thirds, was immediately proceeded with. This part of the work was let to contractors on the 29th of July, 1831; and thus the grading and masonry of the whole Railroad, being thirty-six and two-thirds miles in length, were put under contract. The laying of the first track, and the necessary turn-outs of edge rails, and of a double track of plate railway on the inclined planes, was contracted for on the 11th of April, 1832. The work upon the Railroad was prosecuted vigorously, at one time a force equal to two thousand men being employed upon it; and on the 26th of November, 1833, the first track was so far advanced as to permit the passage of the first car over its whole length.

On the 18th of March, 1834, the road was opened as a public highway; the State furnishing power on the inclined planes only and it continued in use until the 31st of December, when the navigation of the canals of Pennsylvania, which this road connects, was closed for the season. The Railway was again opened on the 20th of March, 1835; shortly after which, the second track of edge rails was completed. On the 11th of May, the State began to furnish the whole motive power, locomotive engines being used on the "long level;" and this continued until about the middle of December, when the canals were closed by ice.

The Portage Railroad consists of eleven "levels" or grade lines, and ten inclined planes. The ascent from Johnstown to the summit is $1171\frac{58}{100}$ feet in a distance of $26\frac{53}{100}$ miles; and the descent from the summit to Hallidaysburg is $1398\frac{71}{100}$ feet in a distance of $10\frac{10}{100}$ miles. There are five inclined planes on each side of the mountain, varying in inclination from 4° 9′ to 5° 51′, or from $7\frac{25}{100}$ feet to $10\frac{25}{100}$ feet elevation, to 100 feet base; they are numbered eastwardly, the one nearest Johnstown being No. 1, that nearest Hallidaysburg, No. 10. The following table shows the length, and rise or fall of each "level" or grade line, and of each inclined plane.

	Length.	Rise.
Level No. 1, from Johnstown to plane No. 1,	4.13 miles	101.46 feet
Plane " 1, ascending,	1607.74 feet	150.00
Level " 2, "Long level,"	13.06 miles	189.58
Plane " 2	1760.43 feet	132.40
Level " 3	1.49 miles	14.50
Plane " 3	1480.25 feet	130.50
Level " 4	1.90 miles	18.80
Plane " 4	2195.94 feet	187.86
Level " 5	2.56 miles	25.80
Plane " 5	2628.60 feet	201.64
Level " 6 Summit level at Blair's Gap,	1.62 miles	19.04—1171.58
		Fall
Plane " 6 descending,	2713.85 feet	266.50
Level " 7	.15 miles	0.00
Plane " 7	2655.01 feet	260.53
Level " 8	.66 miles	5.80
Plane " 8	3116.92 feet	307.60
Level " 9	1.25 miles	12.00
Plane " 9	2720.80 feet	187.50
Level " 10	1.76 miles	29.58
Plane " 10	2295.61 feet	180.52
Level " 11 to Hallidaysburg,	3.72 miles	146.71—1398.71

A part of the railway, generally 300 feet long, at the head and foot of each plane, is made exactly level. The planes are all straight in plan and also in profile, excepting that the angles of elevation at the lower ends are rounded off by curves. There are some minor variations in the grades on the "levels," made to suit the ground, which are omitted in the preceding table. From the lengths and heights given above, the average grade of each "level" may be obtained correctly.

The embankments were made 25 feet wide on the top, and the bed of the road in excavations is 25 feet wide, with large side ditches. Where the lines follows the bed of the Conemaugh, it is protected by substantial slope wall. As the railroad is generally constructed along the steep slopes of hills, often of a clayey soil, and as it crosses many small streams, great care in drainage was necessary. Sixty-eight culverts of masonry laid in mortar, the sum of the spans of which is 494 feet, pass under the railroad, besides 85 drains of dry masonry, of from 2 to 3 feet span. There are four viaducts of hammer-dressed sand-stone, to carry the line over streams. The first and largest is over the Conemaugh at the "horse shoe bend," about eight miles from Johnstown. This magnificent viaduct has a single semicircular arch of 80 feet span, and the top of the masonry is 70 feet above the surface of the water. The whole cost of this work was $54,562 24 cts., and by building it, a lateral bend of about 2 miles was avoided. There are two viaducts over branches of the Conemaugh, each of 40 feet span, and one over a branch of the Juniata at Hallidaysburg, having two arches of 33 feet span, which vary 35 degrees from a right angle with their abutments. There is a tunnel through a spur of the Allegheny

at the head of inclined plane No. 1, about four miles from Johnstown, near which the Conemaugh makes a bend of two miles and a half. This tunnel is 901 feet long, and 20 feet wide by 19 feet high within the arch. It is arched for 150 feet in length at each end, and the entrances are finished off with ornamental facades of cut stone. The whole cost of the tunnel, including arching, was $37,498 85 cts. The edge rails used on the Allegheny Portage, are "parallel" rails of rolled iron, weighing about 40 pounds per lineal yard. They are supported by cast iron chairs, which weigh on an average about 13 pounds each. The rail is secured in every chair by one iron wedge.—The stone blocks which support the chairs, contain three and a half cubic feet each, and they are imbedded in broken stone, at a distance of three feet from centre to centre. On a part of the railway, the chairs are laid upon a timber foundation, and on the inclined planes and along the canal basins, at the two terminations of the road, flat rails upon timber are used. At the head of each inclined plane, there are two stationary steam-engines of about 35 horse power each, which give motion to the endless rope to which the cars are attached.—Only one engine is used at a time, but two are provided to prevent delay from accidents. Four cars, each loaded with 7000 lbs. can be drawn up, and four may be let down at the same time; and from six to ten such trips can be made in an hour. The machinery is very simple and effective.—Its construction was superintended by Mr. Edw. Miller, as principal assistant engineer. A safety car attends the cars, both ascending and descending, and stops them in case of accident to the rope, which adds greatly to the security. The credit of this contrivance is due to the principal engineer. The grubbing and clearing of the Portage Railroad cost $30,524. This work was equal to cutting a road through a dense forest, 120 feet wide and about 30 miles long. The grading of the railroad, including the grubbing and clearing, and all works done under the contracts for grading cost $472,162 59¼ cts. This work includes,

337,220 cub. yds.	of	common excavation.
212,034 "	"	slate or detached rock.
566,932 "	"	hard-pan or indurated clay.
210,724 "	"	solid rock.
14,857 "	"	do. do. in tunnel at $1 47.
967,060 "	"	embankments carried over 100 feet.
67,327 perches		slope-wall of 25 c. feet.
13,342 "		vert. do. and wall in drains.

The viaducts and culverts, and the skew-bridge for carrying the turnpike over inclined plane No. 6, contain 28,368 perches masonry, and their total cost was $116,402 64¼ cts. For the first track and the necessary turn-outs, including a double track upon the inclined planes, there were delivered 509,11 stone blocks, each containing 3½ cubic feet, cost $27,072 15 cts.; and 508,901 feet lineal of 6 by 8 inch timber; 239,397 feet of 10 by 10 inch, and 2842 feet of 12 by 12 inch timber, of white oak and pine, which cost $47,184 50 cts. The work done under the contracts for "laying" railway on the first track, including furnishing broken stone, amounted to $135,776 26 cts. All of the iron rails were imported from Great Britain, by Messrs. A. & G. Ralston, Philadelphia, and also a part of the chairs, spikes, and wedges for the first track. The total cost of British iron at Philadelphia imported for the first track, was $118,883 36. The *aggregate cost* of all works done and materials furnished under contracts for the *first track* of railway was $430,716 59½ cts. For the second track there were imported 16,976 bars of edge rails, each 18 feet long, which weighed 1803 tons, 14 cwt. gross, and cost at Philadelphia $87,494 80 cts., or $48 5 cts. per ton. The *aggregate cost* of all work done, and materials furnished under contracts for the *second* track of railway was $362,987 05½ cts. Aggregate cost of work done and materials furnished under contracts for building ten stationary engines and machinery at the inclined planes, houses, sheds, dwelling-houses for enginemen, wells, water-pipes and ropes, first set, was $151,923 30¼ cts.

GENERAL STATEMENT OF THE COST OF THE PORTAGE RAILROAD.

Cost of Grading,	$472,162 59¼
Masonry,	116,402 64¼
First track of Railway,	430,716 59½
Second track do	362,987 05½
Buildings, Machinery, &c., at planes, *first set*,	151,923 30¼
Ten stationary engines, *second set*,	37,779 25
Buildings, &c., for second set of engines,	21,049 59
Depots, machine shops, water stations, weighing machines, and various works,	41,336 66½
	$1,634,357 69¼

The above sum is the cost of constructing the Portage Railroad at the contract prices; but it does not include office expenses, or engineering, or the extra allowances made to contractors, in a few instances, by the Legislature after the work was completed, and beyond the contract prices.

Four locomotive engines have been used upon the "long level" but the expenses of them belong to another account.

About fifty thousand tons of freight, and twenty thousand passengers passed over this road during the season of 1835. This is but a beginning of the vast trade destined to take *this route*, which was nearly an untrodden wilderness five years ago. The State of Pennsylvania has reason to be proud of her public improvements, and the Allegheny Portage Railroad is one of the most important links in that great chain which connects Philadelphia with Pittsburg.

The above statements were derived from official documents in the Railroad office at Johnstown, and consequently may be depended upon.

Johnstown, January 1, 1836.

Printing for the Blind.—We are happy to inform our readers that the British Society for embossing and circulating the authorised version of the Bible for the use of the blind have received the munificent grant of 100*l.* from the British and Foreign Bible Society "towards printing the Scriptures for the use of the blind, by means of an embossed stenography, after the invention of Mr. Lucas." In order, therefore, that the blind may be regularly supplied with the sacred Scriptures, the type is already commenced in this city, and the Society expect to commence printing some time next month. They are, therefore, desirous that the blind should receive the instruction offered them by the Society at their school, 57 Castle-street.—[Bristol Journal.]

APPLICATIONS OF CHEMISTRY TO THE USEFUL ARTS, BEING THE SUBSTANCE OF A COURSE OF LECTURES DELIVERED IN COLUMBIA COLLEGE, NEW-YORK, BY JAMES RENWICK, PROFESSOR OF NATURAL EXPERIMENTAL PHILOSOPHY AND CHEMISTRY.

V.

CARBON, HYDROGEN AND THEIR COMPOUNDS.

(Continued from August No.)

4. MANUFACTURE OF COKE.

Authorities.—Karsten. Metallurgie de Fer.
Dumas Chimie appliquee aux Arts.
Beaumont and Dufrenoy. Voyage Metallurgique.

Rationale.—Coke bears the same relation to bituminous coal, which charcoal does to wood, and is, like it, obtained by distillation at a red heat. Bituminous coal is a compound of carbon, hydrogen, and oxygen, in very various proportions. In the variety called cannel coal, the proportion of hydrogen amounts to 5½ per cent. in the Liverpool coal it is about 3¼ per cent., and in the slaty varieties does not exceed one per cent. The quantity of carbon varies from 75 per cent. in cannel coal, to 90 per cent. in that of Newcastle. The proportion of oxygen in cannel coal is about twice as great as would suffice to convert the hydrogen into water; in the Newcastle coal about four times as great; and in the slaty varieties, it but little exceeds the proper relation.

Coals may be divided into three varieties:

1. Those which contain at least three per cent. of hydrogen, and, at most, as much oxygen as will convert half the hydrogen into water.

2. Coals which contain oxygen in such quantity as to convert two-thirds of the hydrogen into water.

3. Coals which contain oxygen enough to convert the whole of the hydrogen into water.

The first of these varieties fuses when heated, and the excess of hydrogen uniting with a part of the carbon, escapes in the gaseous form; by the formation and escape of gas, the coke is rendered light and porous. The second variety fuses also, but the quantity of gas formed is not sufficient to render the coke porous, it is therefore compact and massive.

The third variety does not fuse, and the escape of the vapor of water reduces the mass to the form of powder.

Coal of the first class increases in volume when it is coked; the other two varieties yield coke in less volume than the coal employed. In their uses in the arts, the first furnishes the most valuable coke; the last that of least value.

Coke may be prepared in iron cylinders or retorts, but this is only done when the volatile products are to be collected; this method will therefore be described when we treat of the preparation of gas for illumination. Treated in this way, cannel coal yields about 50 per cent. of coke, and that of Newcastle as much as 80 per cent.

When the distillation is performed at a low temperature, the weight of coke is increased, but its volume and porosity are

diminished. It is therefore advantageous, when the volatile matters are not the principal object, to effect the decomposition of the coal by a sudden and high heat.

Preparation.—When coal is rich in hydrogen, it may be readily coked in heaps resembling the *pits* used in preparing charcoal. The coal must be in pieces having not less than three or four inches in each dimension. The heaps are conical, having a base 15 feet in diameter, and a height of about 30 inches. The heap may be best covered with straw, on which is laid a layer of moist earth, the straw being so applied that the earth cannot enter into the spaces between the pieces of coal. But as the use of straw is expensive, it is more usual to cover the large coal for about the height of a foot from the ground with smaller pieces, and the outside with coal-dust; the top of the heap is covered with the refuse coke which is left in the form of powder, in handling that obtained in previous operations. The heap being finished, a few lighted coals are dropped into an opening of six or eight inches in depth left in the top; the space is then filled up with fragments of coal, and when the combustion has fairly commenced, the whole is covered with earth or refuse coke. The rest of the process is much the same as that of preparing charcoal, but is easier, as coal when in mass will not continue to burn after the gaseous matter has escaped, unless new surfaces be exposed to air.

In heaps of greater diameter and height than we have described, the combustion would be too slow at first to form a porous coke, and so rapid at the end as to render it difficult to extinguish. Yet so large is the quantity of coke which is required in some instances, and particularly in the manufacture of iron, that heaps of so small a size would be attended with inconvenience. The shape of the heap is therefore changed in such cases from a cone to a long prism. The breadth of this must not exceed 15 feet, nor its height 3 feet, but its length may be unlimited. This prism must be set on fire in the mode we have mentioned at several points on its upper edge. In this way not only may a greater quantity of coke be prepared at a single operation, but the time is shortened, the conical heaps requiring three or four days for their conversion into coke, while the prisms are finished in 24 hours.

The product is usually about 40 per cent., but some coals, that of Virginia for instance, yield 50 per cent. If a coal, in consequence of its containing but little hydrogen, does not burn freely, it cannot be converted into coke in this way. Such a coal was found in Yorkshire, (England,) in association with minerals which would render the manufacture of iron profitable. In order to apply it to this purpose, an intelligent manufacturer (Wilkinson) imagined the application of a chimney, for the purpose of obtaining a more powerful draught. This chimney is conical in form, about a yard in height, and as much diameter at bottom; the diameter at top is two feet; it is built of brick, the lower courses of which are laid in such manner as to leave openings. Around this chimney the coal is piled in a heap, whose radius is about 6 feet greater than the outer radius of the chimney. This heap is composed of alternate layers of large and small coal, the lowermost layer being of pieces of the largest size. The surface of the heap is covered with ashes or refuse coke, and fire is applied by throwing burning fuel into the chimney. Wet ashes are kept on hand to close any cracks which may occur in the cover of the heap. Dense smoke flows from the chimney, and is followed by a blue flame; as soon as this appears, the top of the chimney must be closed by a plate of cast iron and the combustion will speedily cease.

The coal of Pittsburgh, Pa., as far as we can learn, must resemble in quality the coal employed by Wilkinson, for although far removed in character from anthracite, it has not hitherto been converted into coke by the use of the mode first described. We cannot but express our belief that the method of Wilkinson would be found sufficient for the purpose and that by its aid the manufacture of iron from the ores might be introduced into that city, which at present receives almost all the pig iron used in its extensive foundries and forges, from the opposite side of the Alleghany range of mountains.

This method has also been introduced, with some modifications in Staffordshire, where the coal is of better quality. Here the coarser coal is placed in contact with the chimney, and the finer at the outside of the heap, the whole being covered with ashes or refuse coke, leaving a few openings for the admission of air. As soon as the coke is finished, water is poured on the heap to extinguish the combustion. In this way the product of coke is raised from 40 to 50 per cent.

All the methods of which we have spoken require that the coal should be principally of that size which is of most value for other purposes, namely in coarse fragments. Much however of all good coal is reduced to dust in its extraction from the mines, and in the handling it must undergo. This, in most parts of England, is totally lost, and it has even been necessary to burn it in heaps in order to get rid of it.—In France, where coal is more scarce, and consequently of more value, it has become an important object, that none but such refuse coal should be converted into coke, and the coarser pieces left to be employed for other purposes. This object has been successfully accomplished in the neighborhood of St. Etienne.

The heap in which the coal is burnt may have the form either of a truncated cone or oblong truncated pyramid. The latter form is the most easily constructed, and described. A case of plank is formed, having the desired figure, say a base of 50 or 60 feet in length by 4 feet in breadth, a height of $3\frac{1}{2}$ feet; and the planks are so inclined as to make the dimensions of the upper surface two feet less in each direction than that of the base.

The planks which form the ends of the case are each pierced with four holes: one at the base, one directly over it and near the top, the other two at half the height of the plank, and in the vertical plane of the upper edge of the sides. Each side is also pierced with three ranges of holes, having the same arrangement in quincunx as those of the ends, and at the same distances.

These holes serve for the introduction of tapering spars. The spars of the lowermost layer are passed through the holes in the sides and ends, at right angles to the respective direction of these surfaces, and at the angles where the spars meet each other, vertical spars are set up. The second range of spars is inclined to the sides in such manner as to meet the vertical spars; and the third layer has the same direction as the first.

The fine coal is prepared by mixing it into a paste with water, by means of a hoe. It is then thrown into the case, and well rammed upon the lower range of spars, until a bed has been formed to receive the second range of spars. This latter range being placed, more coal is thrown in and rammed, until the height of the third range of spars has been reached, and this being introduced, the rest of the case is filled in the same manner.

In order to lessen the expense of the wood employed, the heap may be built in successive portions, each ten or twelve feet in length, and when one portion has been finished, the planks and spars are removed to enclose and form passages in a second portion. The spars form conical passages in the mass, by which air may be admitted during the combustion. When the heap has thus been completed and covered with ashes and refuse coke, all the wood is removed, and the heap is set on fire by igniting small heaps of coarse coal upon each of the openings left in the upper surface by withdrawing the vertical spars. It has been found that in pyramidal heaps, about $\frac{1}{25}$ part of the coal to be coked is required for this purpose; but in small conical heaps, where a single vertical spar will suffice no more than $\frac{1}{70}$ will be used.

The attention of the workmen must be directed not only to close the cracks which may appear in the cover, but to keep the passages left by the spars open by means of iron rods. The completion of the process is known by the cessation of the flame. Water is then introduced into the lower passages, whose steam in passing through the incandescent heap is decomposed, and furnishes hydrogen which escapes in flame. The heap is then covered closely with earth, and left until it cools.

In this way coal which would otherwise be lost, yields 50 per cent. of coke of excellent quality.

When coal of the first variety (with the exception of cannel coal) is distilled in close vessels it yields from 70 to 80 per cent. of coke, by the combustion of about ten per cent. of coal. As the best of the methods we have yet described yields no more than 50 per cent., and the most common of them no more than 40, there is obviously a very great waste. In the neighborhood of coal mines this is more than compensated by the simplicity

ued facility of this process. But at a distance from mines a more economic process is necessary, unless coke can be transported from this vicinity, which is by no means easy, in consequence of its friable character, and its being liable to injury by being wet. The best apparatus for this purpose is called the coking oven. This is formed of a cylindrical wall about 2 feet in height surmounted by a dome, from the summit of which rises a chimney about 18 inches in height. In the circular wall is a door about 18 inches by 12 inches, having an iron shutter. The coal is introduced through the chimney, and spread by a rake over the floor, to an uniform depth of about 4 inches. Burning coals are then dropped through the chimney, and as soon as the ignition is fairly commenced the door is closed. When a blue flame begins to appear at the chimney, the top of it is closed by a plate of iron. In this method about one half more coke is obtained than by the ordinary heaps.

Large spheroidal kilns, and reverberatory furnaces have also been used, but their principal object was the preparation of the coal tar. As this article has not proved to be of any great value, and is besides produced at gas-works in quantities greater than can be consumed, it is unnecessary to describe these kilns and furnaces.

It may be here mentioned that turf or peat may be carbonised as well as coal or wood. The fuel thus produced is of very excellent quality, and may be applied to the same purposes as that obtained from wood or bituminous coal.—Pits as used in preparing charcoal have not been found well adapted to the preparation of the charcoal of turf. The little that has been made of good quality was prepared in iron cylinders, but as this is too expensive for manufacturing purposes, it appears probable that if it should ever be necessary to carbonise turf on a large scale it will be done in kilns like those described under the head of charcoal.

5. LAMP-BLACK.

AUTHORITY.—Encycolpedie Methodique—Arts at Metiers.

Lamp-black derives its name from its having been originally obtained by collecting the soot of lamps. This method is still used in some cases. Linen wicks are immersed in linseed oil and lighted; the smoke is received in a copper vessel on which the soot is deposited. What is called ivory black was made at first by receiving the smoke of similar wicks upon plates of ivory.

At present lamp-black is manufactured on a large scale, by burning refuse resinous substances, or even from the soot of coal. When resinous matters are employed, they are placed in a kettle over a furnace, and free access of air is admitted over the mouth of the kettle. The resinous matter being heated fuses at first and finally takes fire, giving out a dense smoke. This smoke instead of being carried off by a chimney, enters a lofty circular chamber; the roof of which is conical with a single opening in the centre. From this roof a cone of sheet iron is suspended by a pulley, and nearly fills up the area of the chamber; this cone has also an opening in the centre. The interior of the chamber, and the lower surface of this cone are covered with coarse woollen coth or with sheep skins. Upon these the soot settles, and may, when the combustion is over, be separated by drawing the sheet iron cone up and down by means of the pulley.

Lamp-black is extensively used as a paint, and there are other forms of vegetable charcoal which are applied to the same purpose. Even common charcoal reduced to powder is sometimes so employed.

Blue black is formed by burning the kernels of the peach in crucibles, to which the covers are carefully luted, with but one opening for the escape of the gas.

A very fine black is made by treating the twigs and tendrils of the vine in the same manner. The article called black chalk, and used in the manufacture of crayons, or for drawing, without preparation is the charcoal of a shrub (*fusain*) which grows in France.

The black used in Europe by engravers is made from a mixture of wine-lees, peach-pits, ivory and bone, calcined and ground to powder. It is prepared for use by making it into a paste with linseed oil.

6. ANIMAL CHARCOAL.

AUTHORITY.—DUMAS, Chimie appliquee aux Arts.

History.—In the preceding section we have mentioned the original mode in which ivory-black was prepared. For that method, the calcination of fragments of ivory in close vessels was substituted, and it was speedily found that an article little inferior was to be obtained from bones. Still, so long as the sole use to which either was applicable was in the art of painting, this observation was of little value. At the end of the last century, however, it was discovered that carbon, in any form, had the property of discharging the colors, taste and smell of liquid vegetable substances. Common charcoal was at first used for this purpose, but in 1811 it was discovered by a chemist in the south of France, that animal charcoal was much more powerful in its effects, and was capable of separating rapidly and certainly, vegetable coloring matter from any liquids whtasoever. Since that time the manufacture of animal charcoal has risen to great importance, and we shall hereafter have occasion to cite several important applications that have been made of it in the arts.

Preparation.—Animal charcoal is usually prepared from bones, and at the same time ammonia is obtained. We have had occasion to refer to this process under the head of that alkali. Some farther details are, however, necessary. The carbonisation of bones is performed in cast iron cylinders, similar to those used in the manufacture of nitric and muriatic acids. The tube which conveys off the volatile matter must be three inches in diameter, and connected with a series of three necked bottles.—The opposite end of the cylinder to that where the tube issues is closed by a dish, which has no opening in it. The bones are broken to pieces and freed from the fat by boiling. They are placed in the cylinders and kept at a red heat for thirty-six hours; at the end of this time they are taken out, and shut up in close vessels to prevent combustion, until the charcoal is cold. The charcoal is then stamped into coarse powder, and finally ground between millstones into fine meal.

If it is to be used as a paint, it is again ground with water, and then dried in earthen moulds. Another form of animal charcoal which was formerly lost, is that left in the preparation of Prussian blue. In this manufacture blood is calcined with potash, and the charcoal is obtained by washing off the alkali.

APPLICATION OF ANIMAL CHARCOAL TO THE DISCHARGE OF VEGETABLE COLORS.

The action of charcoal in discharging colors seems to be owing to the same cause as its power of condensing gasses; of one of which it takes up 90 times its own bulk. The action in this case is due to a mechanical attraction, and to this we may ascribe its powers of retaining the coloring matter of liquids filtered through it. Animal charcoal, upon this theory, owes its superior effect to its greater degree of division; this minute separation of its parts is evident from the fact, that the actual carbonaceous matter in calcined bones does not exceed ten per cent. and is yet sufficient to give its intense black color to the remaining mass of phosphate and carbonate of lime. In that obtained in the manufacture of Prussian blue the division is still more minute, as it is in fact a chemical precipitate from the blood employed, it has for this reason a still more powerful effect. In consequence of this divisibility a larger surface is provided by which the attraction may be exerted.

The liquids which best evince the powers of charcoal in discharging colors, are the solution of indigo in sulphuric acid and molasses. The relative powers of different forms of charcoal on these solutions are exhibited in the following table, the power of that obtained from bones, without further preparation being taken as the unit.

	Indigo.	Molasses.
1. Calcined bones,	1.00	1.00
2. Soot of vegetable oil fused with artificial phosphate of lime,	2.00	1.90
3. Calcined bones from which the phosphate of lime has been washed by muriatic acid,	1.87	1.60
4. Calcined bones again calcined with potash,	45.00	20.00
5. Albumen or Gelatine calcined with potash,	35.00	15.50
6. Blood calcined with potash,	50.00	20.00

In order to render the above table useful it is to be stated that a given quantity of calcined bones will discolor the solution of one thousandth part of its weight of indigo.

or nine times its weight of molasses. After producing this effect it will not act again until the coloring matter absorbed has been separated by calcining the charcoal a second time.

As an instance of the use of these substances in the arts, we may cite an article well known in our markets. The made wine, called Marseilles Madeira, is prepared from the common red wines of the south of France. Their deep color is discharged by filtering them through animal charcoal, and they are made up to the American palate by the addition of brandy. The peculiar smell and taste of the original wine is discharged at the same, and it is thus ready to receive such as may be given it artificially.

Animal has similar advantages over common charcoal in the rectification of spirituous liquors. By its use, all the peculiar and often offensive taste and smell of these liquors may be separated. We shall have occasion to treat of these uses of charcoal under their proper heads.

A carbonaceous substance, having powers in these respects about equal to calcined bones, has been prepared from a species of shale charged with bitumen, which is found in some geological formations, and particularly in the strata of coal fields. In the separation of the volatile matter the shale becomes extremely porous. It is therefore well adapted to the construction of filters, which may be made of slabs of the carbonised rock.

7. GAS-LIGHT.

Rationale.—Bodies which burn with flame must be either volatile, or capable of furnishing a gas when heated. Thus, phosphorous and sulphur burst into flame, when heir vapor escapes freely, and the vapor of alcohol is readily ignited. Any aeriform body whatsoever, if intensely heated, assumes the appearance of flame. In oleaginous, resinous, and bituminous substances, a red heat causes a decomposition, and new combination of their elements; these new combinations are both gaseous and volatile, are readily ignited, and in burning form flame. Thus in a common fire of bituminous coal, bitumen is first formed; this is again decomposed by the heat, yielding tar and gaseous carbeurts of hydrogen; the former yields vapor, which in mixture with the gas burns with flame. In a common lamp or candle, the wick composed of inflammable matter readily takes fire; the heat thus produced melts the tallow, when that is used; the liquid tallow, or oil, is drawn up by capillary attraction into the pores of the wick, and coming in contact with its ignited part, is decomposed and yields carburetted hydrogen; this is set on fire by the ignited wick, and flame is formed.

Gases do not become luminous, nor assume the appearance of flame, except at very high temperatures, far higher, indeed, than those at which solid bodies become luminous. If then, a gas, when heated in the act of combining with oxygen, so far as to become luminous, should deposite a solid body, or if the product of the combustion should have the solid form, the flame will be brill a t; but if the product of the combustion remain in the state of gas or vapor, the flame will give but little light.

Thus, when phosphorus is burnt, the whole product is solid, and the flame has the greatest brilliancy of any that is known; when heavy carburetted hydrogen, (olefiant gas) burns, a part of its carbon is deposited, which, disseminated through the flame in a solid form, gives it the lustre due to an intensely heated solid; but when hydrogen or alcohol are burnt, even by the aid of a stream of oxygen, which causes the greatest heat of any known combustion, the flame will have so little brilliancy as to be hardly visible in the bright light of day, because the products are aqueous vapor and carbonic acid gas.

Combustible bodies may not only be decomposed directly in a fire, or by the aid of wicks, but they may be heated in close vessels, and the gases which are evolved may be kept in proper reservoirs until needed for the purpose of illumination.—From these vessels they may be carried in pipes to the place where the light is needed, and inflamed by an ignited substance as they issue from beaks of some convenient form.

When combustible bodies, whose principal constituents are carbon and hydrogen, are decomposed by heat, these elements may be either wholly separated or may enter into new combinding. The products are therefore carbon in the solid form which remains in the apparatus where the decomposition is performed; hydrogen uncombined; light carburetted hydrogen, olefiant gas or heavy carburetted hydrogen; liquid carburets of hydrogen; and tar. In the present case the resdiuum of carbon need not be spoken of, nor would we have any thing to add to what has been stated under the heads of Coke, and the several varieties of charcoal. Hydrogen has the smallest density of all known bodies, and in burning produces the most intense heat; but as the product of its combustion is aqueous vapor, and that extremely rare in consequence of being generated at a very elevated temperature, the flame has so little brilliancy as to be hardly visible in the light of the sun. Light carburetted hydrogen is a compound of one equivalent of carbon to two of hydrogen. The density of the compound is increased to eight times that of hydrogen, or the numbers which respectively represent these specific gravities are 1 and 8. In a close vessel it is not affected by a heat below one approaching to whiteness; but at a white heat or a little below, it is decomposed, and deposites its carbon. When burning freely, sufficient heat is generated to produce this decomposition, and he carbon deposited in the flame having the solid form, and therefore becoming more luminous than the hydrogen or the aqueous vapour which that gas forms, gives brilliancy to the flame. Light carburetted hydrogen is not absorbed by water to any appreciable extent.

Olefiant gas contains twice as much carbon as light carburetted hydrogen, and may be considered as a combination of one equivalent of each of its constituents; the volume of the hydrogen is reduced one half, and the density of the compound is fourteen. Even at a low red heat, olefiant gas begins to decompose, depositing half its carbon, and being thus converted into light carburetted hydrogen whose density is lessened in the relation of 8 to 14. At a full red heat it is completely decomposed. In burning therefore it deposites twice as much carbon from an equal weight of gas, furnishes a flame of equal size to that of twice its bulk of hydrogen, and which is far more brilliant, in consequence of the quantity of carbon deposited in the flame being twice as great.—Olefiant gas is therefore the most valuable of those generated by the decomposition of combustible bodies, and in the manufacture of them every exertion should be made to obtain it in the greatest quantities, which the nature of the material will admit, and to preserve it from waste after it is formed. The most obvious cause of waste is its having a greater degree of solubility in water, than the light carburetted hydrogen or pure hydrogen; water taking up one eighth of its own bulk.

Two liquid carburets of hydrogen were discovered by Faraday to exist in gas. These are very volatile, one of them boiling at 60 Fahr. and the other as low as the freezing point. Both of these may therefore exist in vapor at mean temperatures, and the latter under almost all circumstances. They both contain more carbon than olefiant gas, and therefore furnish a flame of greater brilliancy, but it may happen that all the carbon they deposite is not consumed, and thus, too great a proportion of them may take the form of smoke.

The vapors of these carburets agree with olefiant gas in one property, viz., they are decomposed by chlorine, rapidly and without the aid of light, while hydrogen, and light carburetted hydrogen, are condensed by it more slowly. As these vapors and olefiant gas are more valuable for illumination, the measure of the quantity of a given mixture which is condensed on the first application of chlorine is the best of all tests for the value of gas intended for illumination.

Another liquid carburet, analogous to Naptha is likewise produced in the decomposition of coal. As this does not boil below 180°, but little of its vapor can be present at ordinary temperatures; but if present it produces a dense smoke, except in burners of the best form.

The tar need only be mentioned here in consequence of its being capable of decomposition by being returned to the apparatus, and thus of yielding the gaseous and volatile compounds just spoken of. In the laboratory, or under circumstances where the heat may be carefully regulated, the character of the products may be varied to a very great extent. From bituminous substances little else but tar may be obtained, and oleaginous substances will yield little but their own vapor, if the apparatus be not permitted to become red hot. If allowed to rise to a low red heat, olefiant gas, and the two volatile carburets will become the principal products; at a

higher heat light carburetted hydrogen; and at a white heat uncombined hydrogen. In the successive stages of the process, the several substances will come over mixed in various proportions, and each in its turn will cease to appear.

In manufactories on the large scale, such nicety is impracticable, nor is it ever necessary. It is then sufficient to divide the matters which are used into two classes, each of which requires a peculiar management.

The first class comprizes those substances which do not decompose rapidly until the light carburetted hydrogen is formed. These must be subjected to a full red heat; for an attempt to obtain the more valuable compounds would be attended both with delay and a waste of the material. Still as some olefiant gas will be formed, no more water should be used in purifying them than is absolutely necessary to remove offensive matter.—Coal is a body of this class.

The second class comprizes those which may be decomposed with sufficient rapidity, at a temperature consistent with the existence of olefiant gas. These ought to be treated at the lowest temperature which will ensure the decomposition of their own vapor; one which merely gives a red glow to the surface of the iron vessel used in the process is sufficient for the purpose. To this class belong oils, and the solution of rosin in spirits of turpentine.

History.—The adaptation of a wick to oil or tallow, in order to obtain light by the decomposition of these substances, and the ignition of the gases and vapors they yield is among the oldest of human inventions. On the old continent neither tradition, written history, nor even mythological fable reach the epoch of its discovery.—Yet it must have been introduced prior to the separation of the races which peopled the two continents; for while in the ancient world there is no tribe so rude and savage as not to be acquainted with the use of the lamp, even the polished nations which occupied Mexico and Peru were ignorant of it. The only inhabitants of the Western hemisphere who used wicks were the Esquimaux, and if they be an ancient American race, they may have derived this information from Greenland, which was peopled at a remote era by a Norwegian colony.

The idea of separating the two processes which take place in the wick, effecting the decomposition at one time, and storing up the gases for use did not appear to have occurred to any one until the year 1785, when it was proposed by a French engineer of the name of Lebon. This was applied to the distillation of wood, and he endeavored to collect at the same time the pyrolignous acid which was evolved. It does not appear that this use of his invention was attended with any valuable result. In this country, however, about 30 years ago, the apparatus of Lebon was manufactured in Baltimore, and occasionally used for the distillation of bituminous coal. The retort employed was of the shape of a flower pot and made of iron; to this a cover was fitted by grinding, whence a pipe proceeded; and the pipe was usually divided into two branches each of which terminated in a burner. The retort being filled with coal was set in a common fire, and the gas ignited when it began to escape from the burner. In order to prevent the offensive smell of the gas from being apparent, the lights were kept beneath the chimney.

Previous to the year 1806 the factories of Watt and Bolton at Birmingham, and of Philips and Lea at Manchester were lighted by gas obtained from coal; and in the ten years succeeding, it was generally introduced into all the large manufactories of Great Britain. It was also occasionally used in smaller establishments, and in particular at Ackerman's in London, whose example had a powerful influence in bringing it into public notice. When first applied, no attempt was made to purify the gas, its use was therefore extremely offensive, and by no means wholesome. During the ten years of which we have spoken the character of the gases evolved in the decomposition of coal were chemically examined, and by the aid of science, the mode of separating every offensive substance, and most of those injurious to combustion discovered.

In 1815, some streets in London were lighted by coal gas distributed in pipes, and in 1816 the method became general in that city.

In 1817, Taylor and Martineau began the decomposition of oil, which, when properly treated, yields a gas of far greater illuminating power than is given by coal. Previous to this time Mr. David Gordon, a gentleman for many years a resident of the United States, had proposed to render gas portable by condensing a number of atmospheres in strong metallic vessels. So long as no gas but that from coal could be obtained the method promised but little success. On the introduction of oil gas however, the plan was resumed and carried into successful operation. By this method, ships, steamboats, railroad and other carriages may be furnished with the beautiful and safe light given by oil gas; and if it was compelled to give way before the immense capital vested in coal gas manufactures in the British capital, there is little doubt that it might be applied to advantage in a new and open field; particularly in countries where coal bears as high a price as it does in most of our Atlantic cities.

The manufacture of gas from rosin as now usually conducted, was the invention of Professor Daniell of King's College, London. It has, however, been conducted on a large scale no where except in the city of New-York. Mr. Rembrant Peale was however, probably the first who prepared gas from this material, although he treated it in a different manner. The Museum in Philadelphia was lighted under his direction by gas prepared from rosin as long ago as 1814.

a. Coal Gas.

(Concluded in our next.)

AGRICULTURE, &c.

From the Farmer's Register.

ON THE NATURE, FORMATION, PROPERTIES AND PRODUCTIONS OF ARGILLACEOUS SOILS.

BY M. PUVIS.

Translated for the Farmer's Register, from the Annals de l' Agriculture Francais.

EDITORIAL REMARKS.

(Continued from our last.)

XIX. On all the varieties of this soil, provided it is drained, resinous trees seem to become naturalized, and often grow even more rapidly than in the mountainous countries where nature seems to have placed them exclusively. In this soil, where the richest harvests are refused to the cares and labor of man, all the families of resinous trees often prosper better than in our gardens. The larch and the forest pine (*sylvestre*) the sea-pine and the laricio grow vigorously over the whole extent of this soil, when it is laid dry, and the pine *du lord* seems of all to be that which best withstands the wetness. These make an excellent alternation with the deciduous (*feuillus*) trees. A single generation of these large trees, after having enriched man with its productions, often suffices to accumulate upon the soil many inches of productive mould.

I shall not repeat here the observations which I have already made elsewhere upon this soil, the nature and properties of which, appear to have been hitherto so little attended to; however, it is necessary to repeat that in consequence of the impermeability of the soil, the *plateaux* which are formed of it, contain but few springs; because, in the first place, the rain water cannot penetrate into the interior to form and maintain reservoirs to supply them; but especially, moreover, because the interior waters cannot, but with great difficulty, escape through the impermeable stratum, to arrive at the surface. It is probable that in this soil which confines the water, Artesian wells, to give it a passage, would have a better chance of success than elsewhere.

These table lands, having in general some declivity, enough of rain water rests on the surface to injure vegetation, but not enough to form marshes. Marshes proceeding from interior water—from waters below the impermeable stratum, are then also very rare, and can only be met with in this soil, when the impermeable stratum in the bottom of the basins happened to be mixed in places with gravel, which renders it permeable.

The small number of marshes which are found in this soil, are placed in the basins of water courses where the impermeable stratum has been diluted or modified in its nature; they are of small extent, and could be easily drained, because the *plateaux* themselves have, generally, a very sensible slope.

These water courses, destined to receive the water from rains, and especially from the springs of a district, are then also very rare in these lands without springs; and those which are met with, are rapid, and have hollowed out deep valleys; because the bottom of these valleys tends to come

upon the level of the great rivers which flow at the foot of the *plateau*, and because the plateaux most frequently rise several hundred feet above the level of the rivers, the argilo-siliceous alluvion of these basins has been often entirely carried off.*

XX. When the argilo-siliceous alluvion is left to itself, the herbage, which elsewhere covers the soil with a close and lasting carpet, comes up upon it weak and thin; and when the surface is badly drained, its wetness is favorable to *carex* and other species generally of little substance, and even these grow badly and slowly; they are often found accompanied by a variety of moss, which covers the surface, and still more the subsoil when naked and exposed, with its whitish foliage. When the soil is better drained, heath, broom, (*genet*) sheep sorrel, spurry, (*spergule*) fern, the peculiar and exclusive vegetables of this soil, take possession of the surface at the expense of other growths. Sheep are here supported better than on the poor herbage of wetter soils; other cattle also feed and live upon it nearly throughout the summer. The soil derives remarkable advantages from these vegetables which it nourishes: man believes that he has a right to complain of them because they present obstacles to its cultivation; but these species, larger than the feeble grasses of turf, leave more dead remains or litter on the soil, and by a happy foresight of nature, these remains are decomposed with difficulty in this inert soil, assume the character of acid mould, (*humus acide*,) and form future resources for this unfruitful land.†—The plants, of the production of which we complain, are then of great benefit to this soil, or rather to us: they have changed the nature of the soil, they have furnished to it the mould (*humus*) which alone distinguishes its arid sub-soil, and have rendered it at last capable of producing the larger vegetables—the trees which cover it in a great many places. But in a few generations, when the previous growth of heath, or of other plants natural to this soil, has not accumulated great resources, this succeeding growth of trees is soon exhausted. It happens, then, often in this soil, which receives few of the principles of vegetation from the atmosphere, that the whole growth of woods languishes and disappears quickly from the surface; then reappears the alternate cover, or shift (*assolement*) of small plants, the producers of acid mould—and the soil, by these means, stores up new powers for new productions. In this great rotation of Nature's crops, the ages of man count but as years.

Among these soils there are some, however, more happily endowed. The natural rotation then takes a different character: the larger plants continue to live upon them; different characters of these plants only, are replaced by others, and the different families succeed each other. Thus on good mountain soils we see the beech and the resinous trees succeed each other in turn, as on good soils in plains we see the birch replace the oak, which soon reappears itself after one generation of the birch.

XXI. With this great analogy in all the principal points which distinguish these soils, with their identity of composition and of production, we still, on each particular body of table land, or ridge, (*plateau*) meet with circumstances which appear peculiar to each district, and which it is perhaps important to remark. Thus on the great argilo-silicious plateau of the basin of the Rhone, as it rises towards the south and approaches Lyons, it loses the name of Bresse to receive that of Dombes; its soil becomes more sandy, lighter, and less wet, on a great extent of soil. In the most sandy and least wet parts, one of the grasses, the *anthoxanthum odoratam* takes possession every year among the rye, and covers the earth like a carpet. After harvest it blooms, and its numerous heads exhale a cadaverous odor which infects the atmosphere. Some persons are inclined to regard this odor as the principle of the endemic fever of the country; but the fevers prevail where the soil is not covered with the *anthoxanthum*.

Is this *anthoxanthum* the same variety as that of the botanists? The heads, the flowers and the leaves have a great resemblance, the odor of the two plants when bruised, is little different, the smell of the flowers even has some similarity: yet there would be, apparently, good reason to doubt their identity. The plant so called by botanists, is one of the earliest blooming grasses in the spring, and that of Dombes blooms at the end of the summer: that of the botanists has an odor which is in request to give a perfume to hay; its stalks and leaves often rise above a foot; that of Dombes only covers the soil, its flowers rise scarcely six inches, and give out a smell almost intolerable to those not habituated to it. Finally, that of the botanists appears to be long-lived, while that of Dombes can hardly be biennial, for it cannot establish itself in the soil in the course of the year preceding the rye during the fallow-ploughings; it must spring up, at the earliest, in October, with the rye itself, and last three months longer than it, for at the end of October its plants are almost all dry.

If there are two different varieties, it would be still uncertain whether the smell of that of Dombes were natural to it, or arose from the climate and soil which produced it. Could this soil, in which the interior waters are corrupted at the time of the flower's blooming, injure also the odor of the plant? If the two plants belong to the same variety, the question would be decided; the alteration of odor would be owing to the state of the soil at the end of summer.

XXII. What particularly distinguishes the argilo-silicious soil from alluvial soils, and others of good quality, is, that the subsoil, which, as we have seen, does not differ from the upper stratum, is entirely without vegetable matter, while we see in alluvial soils, and even in calcareous soils, mould occurring below the soil, or vegetable surface stratum. Here, there is only a barren clayey sand. Also, while in other soils, vegetables sink their roots to seek nutritive juice below—in this soil the roots run without sinking, because there is nothing to be found below the stratum exposed to the atmospheric influences. This circumstance explains, in a plausible manner, the quick exhaustion of the surface in trees on white land, (*terrain blanc*) and consequently their disappearance after a longer or shorter period of vegetation. It is for this reason, that, while in good soils trees often do little injury to crops, and sometimes even afford them advantageous shelter; in the soil of which we speak, they consume the resources of the surface, starve the surrounding vegetables to some distance, and wither them up, especially during the heats of summer. It is thought sufficient to account for this, to say, that "the shade *burns*." Yet, this ought to have quite a contrary effect, since it evidently shelters from the heat of the sun. But if we remark that this effect takes place in all exposures, that it is more sensible on the south side of trees where the shade does not fall, than on the north, which is often shaded, and that this effect does not occur in deep soils into which the roots descend, while it exercises all its ravages on shallow soils, where the roots run far to draw from the surface; if, lastly, we remark that the evil is much greater during droughts, that it shows itself much sooner on these points than elsewhere, that the evil is seen in the withered leaves of the vegetables, and with all the symptoms produced by drought, we should necessarily conclude that this effect is owing to the absorption of the humidity of the soil and of some vegetable principles, by the spreading roots of the tree at the expense of the crop covering the soil.

But a very conclusive fact confirms this explanation, already so plausible. A row of poplars planted on the edge of a field damaged the crops very much. I caused

---

* And with it, the beds immediately beneath, which have not offered resistance to the flood—such as the marly beds. The surface soil, or mould, of the bottom of the valley, rests then upon plastic clay—a bed more firm, which is not washed up by, and its particles suspended in water, and which has therefore better resisted its force, than the beds of other earth that were super-imposed.—Ed.

† Instead of the plants above named, (which, except sorrel, are not indigenous, and perhaps not known here) let the reader suppose to be substituted the names of our broom grass, the poverty (or hen's nest) grass, pine leaves, and whortleberry shrubs, and the description and the general remarks will suit well for our poor ridge lands, either in woods, or cleared for tillage and again "turned out." These poorest of our natural soils alone, of all in this region, present an accumulation of vegetable matter, so great as to be even injurious to cultivated crops—and which, in that respect exhibit many points of resemblance to the peat soils of Britain, which are unknown in our warmer clime. But it is not merely because the vegetable products above named are slow in decomposing, that they are thus accumulated on our author's "argilo-silicious" lands, or on what we have elsewhere termed "acid soils." The acid ingredient, or property, of such soils, is itself antiseptic, and therefore tending to preserve from decomposition all vegetable matter in contact. Soils made calcareous, of course lose all acid quality, and the decomposition of these, or any other vegetable remains, proceeds rapidly. Possibly, this action of calcareous earth is not merely negative—that the effect is not caused merely by its neutralizing and destroying of the antiseptic acid—but that calcarious earth may also possess a positive septic action, which serves to aid and hasten the decomposition of vegetable matter. Many persons, who have not been guided by reasoning, chemical knowledge or research, have formed this opinion, from observing the rapid and entire disappearance of the fallen leaves on the rich limestone forests, compared to the great and permanent accumulation on the poor woodlands of Virginia. See Essay on Calcareous Manures, 2d ed. p. 31, and ch. 8 throughout.—Ed.

a ditch to be dug so as to cut the roots of the poplars; the following year the crop of wheat on one part, and of clover on the other, was finer in that portion of the field which the trees generally starved, than on all the rest of the field. It must, therefore, have been the roots, and not the shade, which injured the crops, and the roots, there fore, absorbed the humidity much sooner than they consumed the vegetable joices of the soil. Yet, I would not admit that the nutritive juices could have accumulated in the soil which had to nourish, at the same time, the trees and the crop; but I think that the decaying remains of the roots, having become a vegetable nutriment, gave the advantage to those portions of the field which they formerly injured.

XXIII. This kind of soil, it cannot be dissembled, requires great intelligence and constant labor to render productive. It is for this soil that the proverb was made, "*tant vaut l'homme, tant vaut la terre,*" (as man is, so is the earth;) but with great care, much labor, and abundant manures, (*engrais*) it may be raised to a production which compensates the trouble and the outlay.

What particularly distinguishes the argilo-siliceous soil from calcareous soils is, that in these last, crops without (alimentary) manure (*fumier*) grow, feebly it is true, but without appearing to exhaust the soil in a sensible degree; in the other, without manure they will scarcely grow at all. To make this soil productive, there is absolute need of a stimulant to develope its vegetable powers, and the effect of the (alimentary) manure consists as much in stimulating the soil and the vegetable organs, as in supplying them with the nutritive juices. When an equal quantity of manure is given to these two soils, so different in their natures, that its effect on the calcareous soil is perhaps twice as great as on the siliceo-argilaceous soil; whence we should naturally conclude that the faculty of imbibing the principles of vegetation from the atmosphere, is much more powerful in the calcareous soils, and the vegetables it produces, than in the argilo-siliceous soil, and it is that which constitutes their gaeatest difference.

XXIV. But this important faculty, which nature seems to have refused to this soil in its formation, man, by a happy compensation, may give to it, with all the properties and all the advantages which distinguish calcareous soils. If he covers the soil with marl, if he applies to its surface a certain quantity of lime, or sprinkles it with ashes, or even confines himself to burinng its surface, then the nature of the soil is changed; an unusual fertility appears—(alimentary) manures act upon it with more effect, and the soil receives that happy impulse which, when it is extended over the whole surface of the country, changes its entire aspect, and produces in it agricultural wealth, the assured source of prosperity, strength and population. Lime, and the substances which contain it, would then be a very powerful means of vegetation on a soil which does not contain them; spread so as to form scarcely a two-hundredth part of the cultivated stratum, it increases with the ordinary quantity of manure all the productions more than 50 per cent., during a period of more than twelve years. The calcareous particles which it furnishes to the vegetable texture, are not a millionth part of the product itself, since lime does not form a moiety of the weight of the vegetables reduced to ashes. This surplus of production which is not furnished at the expense of the soil, (since at the end of twelve years it will still be richer than before the application of the alimentary manure,) and which does not come from the very small portions of the substance of the lime, (which does not form a millionth of the production,) comes then from the atmosphere. The soil and the vegetables which it supports, have then received from the lime, and from its mixture with the vegetable stratum, the faculty of imbibing from the great reservoir of vegetable elements, carbon, azote, oxygen and hydrogen.

We shall not now expatiate farther on the subject of improvements by calcareous substances: they demand a longer and more particular explanation which will find another occasion.*

XXV. Let us return to our principal subject. As we have said elsewhere, by a fortunate and beneficent harmony, the formation on which the argilo-siliceous soil rests is calcareous, and contains marl in great abundance; there is not within our knowledge an argilo-silicious *plateau* in which marl has not been found at a greater or less depth; generally, it is found where the ridge or table land ends on reaching the alluvions of the basins, and in the inflexions of the soil where the waters have carried off a considerable part of the deposite.†

On a great portion of the surface of the *terres a bois, terres elytres* of Belgium, and of the Department of the North, marl has been found. In Picardy, it is brought up from some depth; on the table lands of the three departments of ancient Normandy, it is sought at a depth of 100 feet, even of 200 feet from the surface; Puisaye obtains it on the surface (in out-croppings) and Dauphiny at a slight depth.

Our great *plateau*, which extends into three Departments, shows it on the borders and in the basins of the streams which water them. On most of the great *plateaux* which border on the Loire, and which form a great part of the soil of a dozen Departments, marl is frequently met with, and is in many cases successfully employed. The *boulbins* of Toulouse have it also, and make use of it with great advantage.

* And which has been already presented to the readers of the Farmers' Register in Vol. III. in M. Puvis' essays on lime and marl.—Ed.

† Even in this important respect, the resemblance holds between the argilo-silicious lands of the author, and the "acid" ridge lands of lower Virginia, and probably of Maryland and North Carolina. Though not the marl described by M. Puvis, a calcareous statum of fossil shells underlies, at various depths, nearly the whole of this vast region: and though it has as yet been reached for use only where its out-croppings show at the surface, in future times, when the value of this improvement will be properly understood, this bed will be found and obtained by deep pits, almost in every neighborhood, and for the use of large spaces which are now considered destitute of, and entirely debarred from this manure.—Ed

Finally the plateau which forms the Gatinais and Sologne, which declines partly to the Seine and partly to the Loire, rests every where upon calcareous deposites. Marl is found either on the edge of the plateau, or at a little depth in its first portions, or finally in basins of the streams which water them. We may then regard it as certain, that generally, there prevail under the argilo-siliceous deposite a calcareous formation and deposites of marl, which when brought out upon the surface may give it a fertility almost equal to that of the most favored soils.

Nevertheless, sufficiently numerous observations have often shown me a stratum, not calcareous, but resembling, in its exterior characters, the earthy marl, on the nature of which chemical tests alone have been able to undeceive me. This stratum, which is nothing else than what we have distinguished by the name of plastic clay, is met with from time to time on the table lands, and in the spots where we may expect to find marl; but it is still more frequently found at the bottom of brooks, where it serves as a sub-soil to poor meadows. I have found it sometimes in cysts (*sacs*) with marl, and by its side. I have met with it upon the marl; but often below it: the plastic clay should then be subordinate to the calcareous stratum, as this last is to the argilo-silicious statum, and we should hence conclude that where the plastic clay is met with, the calcareous stratum is wanting—has been carried off—and consequently marl will not be found.

If this law of super-position exists, as is probable, it may be of great use in searching for marls; but observe, that the clay does not exclude the marl, except upon the spots where it is found; and that it is no proof of exclusion on the neighboring portions. The earthy strata of the surface have been greatly warped (*tourmente'es*) and displaced; they are, therefore, even in the same district, far from occupying the same level, and from being regularly met with at the same depths; nevertheless, in this disorder, great as it doubtless is, the law of super-position which we have noticed does not cease to exist.

XXVI. Marl and lime are powerful agents of fertility in this kind of soil; but for both, and particularly for lime, it is necessary that the soil should be drained, or they must be applied to it in quantities resembling those of the English. With this condition of the soils being invigorated [by draining,] these two agents have already changed the face of extensive districts, which have been doubled by their means in wealth and population. An age ago, Norfolk, now a county of classic agriculture, was covered with heath; it is marl which has rendered it capable of bearing that succession of crops which makes it rival the most favored soils in fertility. One-third perhaps of the cultivated soil of England and Scotland has received, and still continues to receive, from lime, an impulse of fertility which raises the mean product of their fields to, at least, a half more than the same soil produces in France. Marl and lime, in Germany, have changed the aspect of

whole provinces. Italy, by lime, has improved the culture of large wet *plateaux*.—America renews by lime the exhausted fertility of vast plains, from which cultivation had demanded too much without returning to them a sufficiency of manure.

In France, La Puisaye in Yonne, has been trebled in value by marl: half the territory of the Department of the North owes its classic cultivation to marl and lime; many cantons of Normandy, the *Arrondissement* of Bernay, the environs of Lisieux, seek for marl at the depth of 200 feet; and finally in Sologne the use of marl has already improved great extents, but unfortunately it is more rarely found there than in other places.

Lime in the three Departments of Normandy has produced effects more numerous, more extended, but yet more recent than marl; a mine of coal (*houille*) of middling quality, worked during the last few years, there furnishes fuel for a great number of lime-kilns, three-fourths of the product of which are employed in agriculture. La Sarthe, Maine-et-Loire, which have employed lime for less than forty years, see their agriculture enriched in proportion as its use is extended.

The Department of Landes, with its barren sands, is covered with harvests by the the application of lime to its soil: there is not perhaps an argilo-silicious plateau, in France, on which trials of marl and lime have not been made with success. We are far, it is true, from a commencement of experiments in their use on a large scale, but it is already a great point to have begun.

Nevertheless, as it appears, scarcely a fourth part of the argil silicious soil can have been improved by either of the means; if they were extended to the other three-fourths, it is not believed that there is any exaggeration in saying that there might result an increase of an eighth in the whole production of the French territory; an immense result, doubtless, and which would not be the only one; for a multitude of observations and arguments, as well as the actual healthiness of the lands where lime and marl have been largely used, should induce a belief that on this soil, improved by the calcareous principle, the salubrity which it wants would reappear with the fertility.

XXVI. When marl and lime are wanting, or at too great a distance, or too dear, their place may be supplied, and, on this soil which requires to be stimulated, an impulse of fertility may be given analogous to that produced by the calcareous agents.—Paring and burning is a resource always certain for these soils; there is then a production of lime in the calcined vegetable particles. The vegetable powers produce potash and lime even in soils which appear to contain none; paring and burning brings into play these active principles of vegetation, which although in small proportions exercise all their influence on the soil; and moreover the clay undergoes a modification which seems to produce upon the soil an effect similar to that of lime, and, like it, to develope, in a high degree, the faculty of imbibing from the atmosphere the elements of the growing plants.

From the Farmer's Register.

ANALYSES AND QUALITIES OF MAGNESIAN SOILS.

BY M. PUVIS.

Translated for the Farmers' Register, from the Annales de l'Agriculture Francaise.

[The following extract is taken from the *Excursion Agnonomique en Gatinais*, of M. Puvis, his publication which next succeeded the foregoing article, and part of which is suited to follow in connexion.—We shall present such parts as may throw light on the other communications of this writer, or otherwise, may seem likely to furnish agricultural instruction.

This part is selected as presenting specimens of a new class of soils, those containing magnesia—and to which ingredient, the author attributes their stability. The facts presented are novel, (at least to us,) and also interesting: but the author's depuctions from these facts, we dissent from altogether. Our views, in contradiction to our author's will be postponed until his opinions have been presented.]

Plateu of Gatinais.

At some distance from Paris, when we leave the valley of the Seine, after having ascended a hill of considerable elevation, we find on the summit the silicio-argillaceous plateau; a great part of the forest of Fontainebleau is situated upon it, as is that of Montargis; this plateau separates the basin of the Yonne from that of the Seine. Silex prevails there in the state of sand; these sands serve as materials for the brown free-stones (*aux gres a cement calcaire et a cement siliceux*,) which are met with in only one part of the plateau; but when the free-stone is wanting, there is always found a great number of flints, which by their form and covering greatly resemble those belonging to chalk, which are found so abundantly in the basin of the Seine as far as the coasts of the sea. Chalk is found on the surface in many places below Paris; but above, it is most frequently covered with many other strata which keep it from the surface; and nevertheless, flints are very numerous in the soil of the plateau. In the same manner, in those of Dombes and Bresse we find the rolled peboles of the Rhone, so numerous in all the formations of the basin; so the argilo-silicious plateaux almost always contain fragments peculiar to the formation of the basins which they overlook.

The fragments of the lower parts of the basin which are found in the argilo-siliceous alluvion of the plateau, would prove, if that had not already been established, that this formation is the most recent, that it was general, and that it took its elements even from the bottoms of the basin, and that it covered these bottoms as well as the high plains, or ridge land.

The Estate of Barres.

At some leagues from Montargis, beyond Nogent, we reach Barres, the property of M. Vilmorin.

This property, which he purchased thirteen years ago, contains 600 *hectares* (1,200 arpents.) His agricultural experiments, his desire to undertake great improvements, were too much confined in the neighborhood of Paris. To be successful on a soil of good quality, was not enough for his activity and his desire to be useful; he therefore made a purchase here on a soil of little fertility, and in his hands, this property has become quite an experimental form. It could not have been better chosen for this purpose, because the land is composed of the two kinds of soil which form the district.

The property is divided into two parts by a small valley, containing 50 arpents of pasture, meadow and marsh, which are divided between the two domains; the eastern part belongs to the calcareous plain which unites with the calcareous plains of Yonne, without, however, being of the same nature as they: it composes two thirds of the property, that is, 800 arpents. The western part, which is more elevated than the eastern, belongs to the argilo-silicious plateau of the Gatinais; of the 350* arpents which compose it, 150 are sloping, and form the passage from the plateau to the valley. These 150 arpents partake of the two natures of the soil; they are of good quality. The remainder, 200 arpents, belong entirely to the plateau, and are composed of sandy sub-soil mixed with angular flints of chalk.

This property offers greater resources in forage than most of the neighboring estates: besides the meadows of the valley, just spoken of, it has some of considerable extent on the Vernisson, a brook which waters the country.

I. The calcareous soil of the plain rests sometimes on a white, granulated marl, which is easily crumbled, and sometimes on a hard rock, which resists the atmospheric influences; it seems to make an exception among those of its class and appearance; its exterior characters would cause it to be esteemed fertile in a great part of its extent; it shows a sufficient stiffness, a dark color which announces a sufficiently strong proportion of mould, and often even the chestnut color, the ordinary indication of a good soil.

It is especially in spring crops that this soil shows its inferiority; oats, barley, and spring vetches come up well enough after sowing, but they are without strength at the time of heading. Clover, lucerne, and sainfoin, take well when sown in the spring; at harvest, the cereal plants cover them; they are vigorous enough, and preserve a good appearance even during autumn and winter; but when the time for shooting arrives, they put up only a small number of stalks.

When the soil remains uncultivated, it is badly covered with turf, produces thistles, euphorbia, and other plants of no use or advantage to the cattle that run upon it. It suffers from wetness. Sheep upon it take the rot; but it suffers still more from drought, which seems to render the stalks of plants stationary upon the soil.

II. The calcareous plateau of which we speak here is very extensive: it reaches from Montargis to beyond Barres, more than 10 leagues in length.

* In the original, this is misprinted as 250.—Tr.

This kind of soil appears to be peculiar to this part of the basin of the Seine; the neighboring calcareous soils which appertain to the basin of the Yonne, present entirely different characteristics; they are dry, it is true, but with a vegetable stratum, they become covered with wild leguminous plants, easily produce clovers, sainfoin, lucerne, and in wet springs, spring crops succeed upon them.

These soils have then something peculiar in their nature which makes them a troublesome exception in the class to which by their composition they naturally belong: they present an agricultural question of great importance to study, and almost new, and they are applicable to sufficiently great extents of soil, since they occupy more than ten leagues in length.

The analyses made of them by M. Henry, at the request of M. Vilmorin, are very interesting, and are as follows:

No. 1. A coarse gray land, the earth of the surface composing at least three-fourths of the ploughed soil of the plain.

10 *grammes* of this earth gave:

Silex,	2.45
Alumine,	0.35
Carbonate of lime,	3.85
Sub-carbonate of magnesia,	0.23
Per oxide of iron,	0.41
Humus { Soluble, 0.12 / Insoluble, 1.70 }	1.82
Water,	0.58
Loss,	0.31
	10.00

The 18 per cent. of *humus*, soluble and insoluble, which this analyses gave, may cause a suspicion that the sample furnished contained more of it than an average of the soil. The proportion of *humus* would be quite extraordinary, since lands the most fertile contain scarcely 10 per cent: and there are hardly any except marsh or alluvial lands which contain it in that proportion: it is nevertheless established by this analyses that this soil contains a great proportion of *humus*, especially of insoluble *humus*.

No. 2. Represents nearly a fourth part of the extent—the portions where the vegetable stratum is very thin, where it is not ploughed on account of its deficiency in fertility, and is used as a sheep pasture.

10 *grammes* gave:

Silex,	1.80
Alumina	0.20
Carbonate of lime	6.90
Sub-carbonate of magnesia	0.47
Oxide of iron	0.27
*Oxide de Magnesie** [manganese?] a trace	0.00
Water	0.20
Humus, soluble	0.05
Loss, and charcoal of insoluble humus	0.11
	10.00

This earth, the least fertile of all those analyzed, contains twice as much carbonate of lime and of magnesia as the former, the color also is whiter. It appears to receive its change of color from the *detritus* (or broken down fragments) of the friable rock on which it is based; its composition is almost identical with that of the sub-soil No. 4, of which we shall give the analyses below.

No. 3. Sandy earth of the calcareous plain belonging to those portions of the plain, which, in the revolution that carried off the silicio-argilaceous stratum, preserved a part of it now mixed with the soil of the plain.

10 grammes of this earth contain:

Silex	7.90
Alumine	0.67
Sub-carbonate of lime (represented by *chlorure*, 0.18)	0.16
Sub-carbonate of magnesia	0.02
Oxide of iron	0.47
*Oxide de magnesie** [manganese?]	0.03
Humus, soluble	0.15
Water	0.35
Loss and charcoal of insoluble Humus	0.25
	10.00

This earth presents a great difference in composition from the preceding, since it contains 80 per cent. of silex and scarcely 16 thousandths of carbonate of lime, and 2 thousandths of carbonate of magnesia.—Yet its properties, its productions and its defects, are nearly the same as those of the preceding numbers. On the other hand, it would seem by its composition to be almost confounded with the sandy sub-soils of the plateau lying on the other side of the valley; but it produces neither heath, broom, nor sheep sorrel, &c.; plants characterizing these sands—and it agrees, as to cultivation; with Nos. 1, and 2, and like them, spontaneously produces euphorblia, thistles and other plants useless to cattle.—It possesses then those common properties of an active agent which must be common to both, which makes them a distinct class; and this agent can be nothing else than the mixture, or perhaps combination of the carbonates of lime and magnesia.

These two principles, therefore, have a very great effect upon vegetation, since 16 thousandths of carbonate of lime joined to 2 thousandths of carbanate of magnesia are sufficient to change entirely the nature and products of the soil. But let us pursue our analyses before making a deduction of all their consequences.

No. 4. Sub-soil of the plain. Its color is reddish, as is that of many calcareous soils of good quality; but having been neither affected nor modified by the waters of the last revolution, in consequence of the shelter given it by the upper stratum; and not having been exposed to the atmospheric influences, it may be regarded as the type of the deposite which forms the soil of the plain, the deposite anterior to the silicio-argilaceous formation.

10 grammes of the sub-soil of the plain gave:

Silex	0.39
Alumine	1.27
Carbonate of lime (represented by *chlorure*, 8.20)	7.41
Carbonate of magnesia	0.41
Oxide of iron	0.31
Oxide of magnesia	0.00
Water	0.06
Humus, soluble	0.05
Loss	0.10
	10.00

* So in the original.—Ed

This soil is a species of marl which contains 74 per cent. of carbonate of lime, 4 of magnesia and 12 per cent. of alumine: its composition is quite similar to that of the analysed soils of the plain.

III. These analyses may afford us important inferences.

These soils evidently make, as we have seen, a distinct class of the silicious soils. Their properties seem to differ at least as much from those of calcareous soils, properly so called, which produced spontaneously the small species of clover, on which leguminous plants of different species succeed easily, and manures almost always secure good crops. It is not then to the carbonate of lime that they owe their inferiority: its action, on the contrary, seems to be nullified, since the characteristic properties of calcareous soils appear no longer to exist in these. Nor is it more to the silex, the alumine, nor the oxide of iron, which are found in abundance in all good soils, that this difference can be attributed. Then, of all their constituents, there remains only the magnesia to which can be owing the characters which distinguish them from their analogous soils.

It has been already fully admitted in principle that magnesia is unfavorable to vegetation. The English chemist, Tennant, formed this conclusion from the analysis of a lime which struck with sterility all the soils to which it was applied. In America the use of a magnesian lime quickly wore out (*fatigue*) the soil; and Davy has admitted it as a truth. Some trials on a small scale have shown me that while in a calcareous soil, beans, when sown, sprouted soon, and came up vigorously, in the same soil modified by an addition of magnesia, germination was retarded, and the stalks especially had only a feeble and tardy growth: yet Thaer calls into question the soil being made sterile by magnesia; and opposes to the conclusions of Tennant, that Einhoff has analyzed a very fertilizing marl which contained 20 per cent of magnesia: and farther, it results from a careful analyses, that the mud of the Nile, which we know to be so fertile, contains a large proportion of magnesia. From these last facts it may be concluded that the magnesian mixture in the soil may indeed, under certain conditions yet unknown, not be injurious to fertility: but there still remain multiplied facts, and the results of observations, of which our whole plain presents us with a new and great example, that many magnesian soils are unproductive.

But how does magnesia occasion barrenness in a soil? This problem is doubtless of difficult solution, but very important, since it seems probable that if we knew the causes which render magnesia unproductive, it would perhaps be possible to remedy them; we shall attempt to point out

some *data* which perhaps may indicate the course.

And first we will remark that the magnesian mixture takes from the soil all its characterestics of calcareous soil, deprives it of all the advantages which always accompany the unadulterated mixture of the calcareous principle, and gives it a character peculiar to itself, which distinguishes it whether by its mode of acting on vegetation, or by the vegetables which it spontaneonsly produces, to the exclusion of those produced by the calcareous soil.

Still farther, it would seem, that magnesia takes from the carbonate of lime the property which eminently distinguishes lime and all its compounds; that of rendering *humus* soluble, and that it tends on the contrary to render *humus* insoluble, in proportion as it is accumulated in the soil by cultivation. In fact, the great proportion of insoluble *humus*, which the analyses have found in the soil which composes three-fourths of the cultivated plain, although a part might have been owing to an accident, could not proceed from spontaneous vegetation in this soil which is almost always under the plough, and which produces few plants. It proceeds then from cultivation: but cultivation does not furnish insoluble *humus;* the *humus* of the manures then have passed into this state in the soil.—Now, it is not the lime, the action of which consists in rendering *humus* soluble, that can have produced a contrary effect; neither is it the silex nor allumine to which it is attributable; it must therefore be charged to the magnesia alone, and to this circumstance we may ascribe the unproductiveness of magnesian soils, in which manures, instead of benefitting the plants cultivated on the soil, pass into the state of insoluble *humus.*

The carbonate of magnesia has, besides, the property of retaining more water than all the other earthy combinations. According to the experiments of Schubler of Hoffwyl, it receives and retains four and a half times its weight. It may be possible that it communicates to the soil in which it is found, the propeity of retaining a quantity of water, which at first would be injurious to vegetation. This would explain the cause of the rot among sheep on this soil; but this water, after having injured vegetation, would not continue in the soil, for it suffers much from drought in the spring.

In this state of affairs, and in a question so important, on which doubts are accumulated, and facts and opinions are arrayed in opposition, it is a great and noble agricultural problem, that the proprietor has proposed for himself to subdue this rebellious soil and force it to yield good crops; we shall see hereafter that this object has been, in a great measure, obtained.

IV. After this long discussion on the magnesian soil of the plain, we come to the soil of the *plateau:* this kind of soil composes a great part of the *arrondissement* of Montargis, especially in the south and south-east portion; it covers besides almost the whole extent of the *arrondissement* of Gien on this side and beyond the Loire. This soil has received the name of *terre de Sologne*; the only differences which characterize the parts sloping towards the Seine and those which slope to the Loire, are the chalk flints in the basin of the Seine and the fragments of different varieties of silicious rocks in the portion of the *plateau* which slopes to the Loire.

The soil of the *plateau* of Barres offers every where a pure clayey sand, which contains in great quantity the chalk flints of the basin of the Seine, and varies little. Yet it is dry or wet, according to the sub-soil on which it rests; when it is based immediately on the calcareous rock of the plain, it is dry; and it becomes wet when the sub-soil is the reddish silicio-argillaceous stratum which does not allow the water to pass through, and consequently preserves the moisture of the surface.

This soil, compared to that of the plain, is not of difficult cultivation. Rye, potatoes and buckwheat, grow well enough upon it; with manures, artificial meadows succeed; and trees of every kind, leafy (*feuillus*) and resinous, shoot up vigorously. On the whole, this portion of soil which touches the calcareous *plateau*, on which besides it rests, is superior in quality to the parts of the *plateau* which are more distant from it. It is even of more easy cultivation, and offers especially more resources than the magnesian soil; nevertheless, it contains no calcareous parts, heath, broom, and wild sorrel, which every calcareous mixture puts to flight, are met with on this soil in all parts of the 200 arpents of it which are left untilled.

V. The rest of the soil, under the plough, of which the property is composed, presents a gentle slope, on which the owner's house is situated. This slope forms the passage from the *plateau* to the plain, going along the valley; it offers 150 arpents of pretty good soil, suitable for all productions, for wheat, artificial grasses, trees, and especially for oaks; this soil is due to a mixture of the soil of the *plateau* and of the plain, but the mixture is not uniform.

VI. Lastly, it remains for us to speak of the little valley which separates the two parts of the property.

This narrow valley receives the waters of the plain and the *plateau;* it contains a great number of springs, which are doubtless the filtered waters of the two *plateaux* which have no visible springs. It is very remarkable that the springs come almost all of them from the side of the calcareous plain, the silicio-argilaceous plateau with its *impermeable* sub-soil, has scarcely admitted any filtration, so its side furnishes few or no springs in the valley.

A great part of the bottom of the basin is marshy, requires draining and seems to us very susceptible of being drained; one part is in pretty good pasture, anotherin tolerable meadows, and the rest in marsh, which is mown for litter.

The calcareous rock shows itself from time to time at the bottom of the valley.—The upper stratum of the soil, belongs rather to the magnesian soil of the plain than to the silicious soil of the *plateau.*—It is firm in all the parts which the interior waters have not diluted. Works judiciously made in the marsh have commenced its draining, the results obtained and a sufficiently great slope, promise, as we shall see hereafter, success to the undertaking. Vegetation in this valley is active, the trees are fine, and if the magnesian principle, as is probable, occurs there, it does not seem to injure vegetation; in this inundated soil, some principles probably exist which neutralize the destructive effect of the magnesia. * * * * * *

REMARKS.

It seems a singular and illegitimate conclusion of the author, that the sterility of the soil of "the plain" is caused by the small quantity of carbonate of magnesia contained. It would have been much more plausible, if the very large proportion of carbonate of lime contained had been considered as the true evil. The soils giving analyses 1 and 2, are stated to be specimens of the whole calcareous and magnesian plain—and No. 4 shows the sub-soil common to both, and to the whole plain. In these two varieties of the same general kind of soil, the proportion of carbonate of lime is 38 per cent. in the first, and in the second, 69 per cent. —and the sub-soil of both, (No. 4,) has 74 per cent. Surely these large proportions of carbonate of lime, are sufficient to account for sterility, after the continuance of exhausting and bad tillage for time immemorial, without looking for that cause in the presence of carbonate of magnesia, which these same three specimens contain respectively in the very small proportions of 23, 47, and 41 thousandths—or less than the half of 1 per cent. We do not believe that this earth (in much larger proportions,) is injurious to soils—but infer the reverse, from the great similarity of its chemical qualities to those of carbonate of lime—and from some of the richest soils in the world containing carbonate of magnesia. Thus M. Puvis himself states that it is in the soil of the rich valley of the Nile—and we have found it in the celebrated alluvial soil of the Red River. The authorities brought to sustain the position that the magnesian ingredient is injurious to fertility, if examined, are worth as little as the reasoning. Tennant, it is true, attributes injurious effects to the magnesia contained in certain limestones; but it is to magnesia brought to its *caustic state*, by the burning of the limestone, and so applied to the soil. This may well be the case, and all the injurious effects of such manure, referred to by our author, may be true, and yet the mild *carbonate of magnesia*, as it exists naturally in soil, may be either harmless or beneficial. Still less does Davy's view sustain this opinion of M. Puvis. That great agricultural chemist quotes Tennant's discovery and statement, but without seeming to concur entirely in the asserted ill effects of even caustic magnesia—and he certainly contradicts the notion that a natural and small proportion of the carbonate is injurious, by referring to the valuable qualities of the Lizard Downs, which have that rare ingredient.

But putting aside M. Puvis' deductions, the facts as to the presence of magnesia,

and the prodigious amount of calcareous earth in this poor plain, are sufficiently worth attention. We cannot, however, presume to reason with regerd to facts which are so concisely and imperfectly presented, or to explain away difficulties which oppose any general and uniform deduction. But we will venture to hint our opinion, that these highly calcarcous plains of France, were at some far remote period immensely rich *prairies* like those of Alabama and Arkansas: and that the latter, if exposed to a similar long course of exhausting tillage, will hereafter be as poor, and as difficult to be improved, as these calcareous plains of France, or the chalk *downs* of England.

The Chinese Duck.—On the lakes and rivers there are of course many kinds of wild ducks and other waterfowl, in their natural and unreclaimed conditions; and the manner in which these are often captured is ingenious, though well known. The sportsmen incase their heads in large gourds or calabashes, with holes for sight and respiration: they then walk or swim deeply in the water, so that nothing but the fruit is seen above the surface; and the unconscious ducks, accustomed to floating and innocuous calabashes, approach them without fear, and are respectively pulled under water, for the purpose of having their necks wrung, and being fastened to a poulterer's gridle. On the banks of the Yang-tse-kiang, and along the shores of the Po-yang-hou, during the progres of Lord Amherst's embassy, wild ducks and geese occurred in large flocks on both the lake and river, and were so tame that they might be approached within a few yards. It is known that prodigious numbers of tame ducks are kept in the various provinces. The peasants hatch the eggs in ovens or in dung, and putting the young ones into boats carry them down to the sea shore at low water; and as these boats keep company, there are consequently several flocks of ducks, not only near each other, but frequently intermingled, while searching for shell fish or other marine productions. Yet no sooner does the guardian strike upon a basin, than each flock flaps away to its own boat. Indeed, among the more singular sights to be seen in the neighborhood of Canton, particularly about Whampoa, are the duck boats, which not only contain the aquatic bibeds, but are used as the dwelling of their owners. The ducks inhabit the hold, while the keepers are accommodated in the upper portion of the vessel. These boats are very abundant about the rice fields near the river, just after the harvest has been gathered in, the birds at that period being able to glen a plentiful supply of food. Each owner moves about from place to place according to the favourable opportunities that may offer for the feeding of his broad-billed flock. "On the arrival of the boat," says Mr. Bennet, "at the appointed spot, or one considered proper for feeding the quacking tribe, a signal of a whistle causes the whole to woddle in regular order from their domicile across the board placed for their accommodation, and then rambling about undergo the process of feeding. When it is considered by their keeper that they have gorged sufficiently, another signal is made for the return of the birds; immediately they congregate and re-enter the boat. The first duck is rewarded with some paddy, the last is whipped for being dilatory; so that it is ludicrous to see the last birds (knowing by sad experience the fate that awaits them) making efforts *en masse* to fly over the backs of the others, to escape the chastisement inflicted upon the ultimate duck."—[Edinburgh Cabinet Library, Historical and Descriptive account of China, Vol. 3.]

Chinese Art of Computation.—The Chinese, in their arithmetic, employ the decimal notation and they perform its operation by means of an instrument called *Swan-pen*. It consists of a frame, divided into two compartments by a bar in the direction of its length. It is next crossed by ten wires or slender rods, which pass through the middle bar, and terminate in its longitudinal opposite sides. Each corss-rod has on it seven moveable beads, which admit of sliding backwards and forwards; five of these are on the part of the rod between the sides of the wider compartment, and two on the part which crosses the narrower. Beginning from one extremity of the frame, each of the five beads on the longest part of the first rod represents a unit, and each of the two on the shorter stands for five. In like manner, each bead on the longest part of the next rod, towards the left hand, stands for ten, and each on the shorter part for five tens or fifty, and so on. It is easy to understand, that by detaching a proper number of beads, which represents units, and tens, and hundreds, &c., by sliding them from the position in which they are represented in the figure, towards the bar which crosses the rods, any number whatever may be indicated; a single bar on the shorter part of the rod answering to all the five on the longer. In this way the Chinese perform their arithmetical operations, just as men reckoned by counters in this country in the manner explained by the old writers on arithmetic, particularly by Robert Recorde, who lived about the time of Queen Elizabeth. The *swan-pen* seems the more convenient mode of the two; and by its assistance the traders in Canton transacts their business with a dexterity and expedition quite remarkable. It must, however, be admitted, that although this machine be well adapted for explaining the principles of arithmetic, it would be a very inadequate subtitute for our Arabic numerals, more especially in those laborious calculations which the progress of European science has rendered indispensable.—[Edinburgh Cabinet Library, Historical and Descriptive Account of China, Vol. 3.]

China Deficient in Timber.—China, like every other country which is densely inhabited, is deficient in the supply of timber and dyewood. The neighboring countries, therefore, which are in a rude state, furnish it, in the same manner that America and the north of Europe supply England, France, and Holland; and if capital were abundant, and freights low, they would export a much larger amount. The supply of wood and other rude produce from the surrounding countries, is a branch of trade into which we think it not improbable that the British merchant will sooner or later enter. The timber furnished at present consists chiefly of fancy-woods; as sandal-wood, from Malabar, the Sandwich and Feejee Islands; that of the first is nearly three times as valuable as those of the two last, being of greater size, and containing more essential oil. The English and Americans, in 1834, imported of this commodity about 300 tons, worth 50,000 Spanish dollars. Rosewood comes from Siam, and ebony from several of the Malayan Islands, but the best as well as the largest quantity of late years has been sent from the Mauritius, while the inferior kind is brought from Ceylon. The woods or barks for dyeing, consists chiefly of sapan-wood from Siam, and the barks of several species of *Rhizophora*, or mangrove, from the Malayan Islands. Under this head may be mentioned rattans and canes, of which the importations, both by native and European vessels, chiefly from Borneo, Sumatra, and the Malayan Peninsula, are very large for such a commodity. We perceive tha, of the former, the weights imported by British ships, in 1830, was equal to 35,000 cwt. valued at about £18,000.—[Edinburgh Cabinet Library, Historical and Descriptive Account of China, Vol. 3.]

Improvements and Embellishments in Paris.—The granite for the pedestal of the obelisk of Luxor has arrived, and only awaits the decrease of the waters of the Seine to be landed. It consists of seven blocks, one of which weighs 120,000 lbs.—The Hotel Dieu, it is said, will shortly be taken down, to carry on the beautiful line of quays which extend along each bank of the Seine. The sick will be removed to the Invalids, which establishment will be broken up, and formed into several branches, in various parts of the country, where articles of provision, &c. are cheap.—[Paris Advertiser.]
